THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR ...DIANE MAY GALLAGHER...

TITLE OF THESIS ...FACTORS AFFECTING FERTILITY AND FEMALE...

...LABOR FORCE PARTICIPATION IN CANADA AND...

...THE UNITED STATES...

DEGREE FOR WHICH THESIS WAS PRESENTED ...MASTER OF ARTS...

YEAR THIS DEGREE GRANTED ...1973...

THE UNIVERSITY OF ALBERTA

FACTORS AFFECTING FERTILITY AND FEMALE LABOR FORCE PARTICIPATION IN CANADA AND THE UNITED STATES

by

(C) DIANE MAY GALLAGHER

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

DEPARTMENT OF SOCIOLOGY

EDMONTON, ALBERTA

FALL, 1973

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled FACTORS AFFECTING FERTILITY AND FEMALE LABOR FORCE PARTICIPATION IN CANADA AND THE UNITED STATES submitted by Diane May Gallagher in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

The main objective of the thesis was to examine the relationship of six demographic and economic factors with fertility and female labor force participation in Canada and the United States. The six factors were: degree of urbanization, median income, extent of primary industry, infant mortality rate, sex ratio, and high parity (proportion of women having four or more children). Individual provinces and states were the units of analysis. The data were acquired from census and vital statistics publications for 1961 in Canada and 1960 in the United States. Multiple regression and correlation analysis were used.

The regression analysis of fertility suggested that five variables had significant direct effects on fertility when considered simultaneously. High parity, median income, infant mortality rate and primary industry affected fertility positively. Degree of urbanization affected fertility negatively. The signs of these effects were as anticipated, except that of median income. Investigation of partial correlations, using the other factors in the regression equation as control variables, suggested that the positive association between median income and fertility was disclosed by controlling for the effects of the other variables through the regression procedure.

The regression analysis of female labor force participation

suggested that four variables had significant direct effects on female employment when considered simultaneously. Primary industry and high parity affected female labor force participation negatively. Infant mortality and median income affected this variable positively. The signs of these effects were as anticipated, except that of infant mortality. Partial correlation analysis suggested that the positive association between infant mortality and female labor force participation was uncovered by controlling for the effects of the other variables in the regression equation.

Current fertility and female labor force participation were negatively correlated, however, neither had a significant direct effect on the other when considered through regression analysis. High parity, a measure of cumulative fertility, and female labor force participation did have significant direct effects on each other. The effect of high parity on female labor force participation was stronger than the effect of this latter variable on high parity, suggesting, for the present data, that high parity influenced female employment rates, rather than the reverse.

The findings of this study were mainly in keeping with the literature consulted and supportive of the research propositions offered.

ACKNOWLEDGMENTS

Completion of a study such as this is virtually impossible without the effort and patience of many individuals.

I am deeply indebted to Dr. Karol J. Krotki for his extended assistance and encouragement as principle advisor. In addition, Dr. Krotki's suggestions helped formulate the initial direction of this research.

I am especially grateful to Dr. W. Andrew Harrell for his close supervision and assistance during the analysis of the data. Dr. Harrell's assistance with the methodological problems and computer programing were invaluable to the completion of this study.

Special thanks are due Dr. V. Bruce Proudfoot for pertinent remarks and critical review of the thesis. Professor Wayne W. McVey's reading of the thesis; preparation of the final diagrams, and encouragement were greatly appreciated. I would also like to thank Professor Michael W. Gillespie for his earlier assistance and reading of initial thesis drafts.

Finally, I wish to thank William R. Avison for statistical assistance, Mrs. Janet Wright for typing the final thesis, and my mother, Mrs. May Gallagher for her continued technical assistance and support.

TABLE OF CONTENTS

CHAPTER PAGE

CHAPTER PAGE

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

The relationship between fertility and female labor force participation and other factors affecting this relationship is important for understanding the growth of the population and economy of developed nations such as Canada and the United States. If female labor force participation and other factors influence fertility, it is important to understand how their influences work, so that accurate forecasts of fertility may be made. Conversely, if fertility and other factors influence women's work participation, knowledge of these influences will aid in forecasting female employment, and thus the economic productivity of a population, which would increase with a rise in the proportion of economically active adults. The forecasting of both population growth and economic productivity for a specific population are desirable goals under present world-wide ecological and economic conditions.

The purpose of this study is to compare the relative strengths of certain factors in explaining fertility and female labor force participation in Canada and the United States. Patterns of association between fertility rate -- births per 1,000 women aged 15 to 44 -- and female labor force participation rate, each treated mainly as a dependent variable, and six additional

economic and demographic factors, treated as independent variables, will be examined.

Four factors widely affected by economic development -- degree of urbanization, proportion of the labor force in primary industry, median income and infant mortality rate -- will be considered as indicators of degree of economic development between states and provinces within the countries studied. A measure of cumulative fertility, the proportion of all women having four or more children (high parity) will be considered as an indicator of family size norms in an area. Finally, variations in sex ratio between areas will be considered. Which of these six variables are significantly associated with fertility and female labor force participation levels in an area and the patterns of these associations will be studied through correlation and multiple regression analysis.

Methods of investigating demographic characteristics such as fertility and female labor force participation may be dichotomized with respect to both unit of study and method of comparison. The data may be collected for individuals (micro study) or for aggregates (macro study). The comparison may be made over time for the same area (longitudinal), or at one point in time for several areas (cross sectional). Thus, four possible types of study may be undertaken. The present study will involve cross sectional comparison of macro data, with

provinces of Canada and states of the United States as units of analysis.

This study is focussed on the effects of differing levels of economic development, within two highly developed countries, upon levels of fertility and female employment. Because ecological measures and correlations will be used, care must be taken to avoid ecological fallacy. Assessments of the relative strengths of association between various economic and demographic factors and the general levels of fertility and female employment found in each area will be substituted for statements of direct causal linkage between variables.

In recent research, predominantly in the United States, fertility experience and female labor force participation have been found to vary inversely, other things being equal: the smaller a woman's family, the greater her participation in the labor force. This finding has been complicated by many intervening variables, most important of which is probably the stage of the family life cycle -- most notably the age of the youngest child (Ostry, 1968, pp. 17-19).

Much current demographic research employing micro data has suggested two broad hypotheses to explain the differential fertility of working and non-working wives in the United States. First, it has been proposed that women having few children, due to some fertility impairment, age, or whatever, have fewer child-

rearing responsibilities and are, therefore, left free to take a job outside the hcme. Second, women desiring gainful employment are motivated to keep their families small (and thus to practice birth control more effectively) and so are less fertile than equally fecund wives who do not want to work (Freedman et al., 1959, pp. 136-137, p. 303; Whelpton et al., 1966, pp. 107-108; Westoff et al., 1963, p. 187).

As stated previously, the causal direction of this correlation cannot be assessed by the present study. The emphasis here will be upon discovering which of seven economic and demographic variables studied, including fertility, are the best predictors of level of female labor force participation and which of the seven, including female labor force participation, are the best predictors of fertility level. On the state- or province-wide level, fertility and female labor force participation may not be the best predictors of each other. Through the use of multiple regression techniques, the relative predictive powers of each of seven possible independent variables upon fertility and female labor force participation may be examined to determine which have the greatest effects on the two dependent variables.

Plan of Thesis

The remaining part of this chapter will provide a background

to the problem and review pertinent literature reporting on factors affecting fertility and female labor force participation. Hypotheses will be derived from this literature. Chapter II will discuss the measurement of the variables under study, data sources, and methods of analysis. The analysis of the data will be presented in Chapter III. The final chapter will present conclusions and suggestions for further research.

BACKGROUND AND REVIEW OF LITERATURE

Economic development has extensive effects on fertility. The shifts from rural to urban, from primary to secondary and tertiary industry; the decline in mortality, especially of infants, as sanitation, medical, education and communication advancements are made, the increases in social and physical mobility, population density, standard of living and wealth of a country all tend to affect fertility. Under demographic transition theory, the stage of demographic transition may represent the stages of social and economic development from a traditional, agrarian to an urban, industrial economic system. Patterns of differential fertility within an economy may then be determined according to the distance that the economy has traveled toward completion of transition (Cho et al., 1970, p. 282). The populations of Canada and the United States could be classified as late transitional (stage three) bordering on post-

transitional (stage four) of the demographic transition. A late transitional population is characterized by low mortality and declining fertility; has achieved considerable advances in industrialization, urbanization, female labor force participation, per capita income and education; and experiences a negative association between fertility and economic status. The post-transitional population, which the white population of the United States is nearing, is characterized by low mortality, low fertility and high degrees of industrialization, urbanization, female labor force participation, per capita income and education. The decreased economic valuation of children coupled with increased cost of child rearing at this stage makes children a consumer item, resulting in a birth rate responsive to business cycles. When the demographic transition is nearly complete, a U-shape relationship between fertility and economic status gradually emerges, to be replaced by a positive association when the post-transitional phase is fully realized (Cho et al., 1970, pp. 283-284).

The decline in American fertility prior to World War II has been attributed to the economic and social changes occurring as a country moves through the third stage of demographic transition, as well as to the Great Depression of the thirties. The industrial urbanization of modern times has been associated with a more complex division of labor and a high rate of social and

physical mobility which resulted in a growth in secularism and rationalism, a decline in the influence of traditional forces and a weakening of the traditional family. As a result of these changes, children ceased to be productive assets, became hindrances to social and physical mobility, and impeded participation in non-familial organizations from which the rewards of urban society stem (Freedman, 1961-1962, p. 56). The shifting of family functions to specialized institutions and the reductions in mortality, especially of infants, corresponding to economic advancement, lowered both the number of children required to achieve socially valued goals and the number of births required to ensure a specific completed family size (Freedman, 1961-1962, p. 53).

The economic, technological and social changes of twentieth century America have also played a large role in the increase of female labor force participation. Mechanization introduced the replacement of male craftsmen with cheaper female operatives. Male labor force shortages during World War II made the employment of married women necessary and more acceptable. The marked expansion, especially in recent decades, of white-collar service and clerical positions considered especially suitable for women, the higher average educational attainment of women than of men, and the relative cheapness of female labor have provided a demand for female employment. Radical improvement in housekeeping

aids which increased leisure time, the shorter work day and week, increase in part-time employment opportunities, educational improvements which affected womens' preferences and marketability for jobs outside the home, the tendency to confine child bearing to the twenties and early thirties, and the growing willingness of family members to help with housework all eased women's entrance into and continued participation in the labor force (Ostry, 1970, pp. 144-145; Canada, Dept. of Labour, 1964, p. 14). As a result of these many social and economic factors, more and more women are looking to fulfillment outside the home in a permanent career, rather than working only until marriage and a family take over their interests.

In Canada the proportion of women in the labor force has grown much faster than the female population since 1901. For example, the proportion of women economically active has grown from 12.0% in 1901 to 20.2% in 1941 and to 29.5% in 1961. The most rapid increase has occurred during recent years: from 1955 to 1964 the participation rates for the female labor force at annual averages rose from 23.9% to 30.5% (Canada, Dept. of Labour, 1964, pp. 9-11). The female proportion of the total labor force has risen similarly, from 13.3% in 1901 to 27.3% in 1961, indicating that the female labor force has grown faster than the male labor force (Canada, Dept. of Labour, 1964, pp. 11-12). Participation rates for women in 1961 were higher than in 1941

for all age groups, and higher than in 1951 for all but the 15 to 19 age group (Kalbach & McVey, 1971, pp. 223-224). From 1951 to 1961, the greatest increases in the proportion of women who were wage earners occurred for age groups 35 to 44, 45 to 54, 55 to 59, and 60 to 64 -- 7.5, 8.6, 9.4, and 6.5 percentage points, respectively (Allingham, 1967a, p. 11). When marital status is examined, the phenomenal increase of married women in the labor force becomes apparent. In 1931, 10.0% of women in the labor force were married. By 1961 this proportion had risen to 49.8% (Canada, Dept. of Labour, 1964, p. 21). As Table I shows, in the decade from 1951 to 1961, the proportion of single women in the labor force decreased, that of widowed or divorced women increased slightly, but that of married women almost doubled (Kalbach & McVey, 1971, pp. 226-227).

TABLE I

FEMALE LABOR FORCE PARTICIPATION BY MARITAL STATUS, CANADA: 1951 & 1961

Marital Status	Percent in the Labor Force	
	1951	1961
Total	24.0	29.5
Single	58.1	54.2
Married	11.2	22.0
Widowed	17.2	20.3
Divorced	70.3	73.2

Source: Kalbach & McVey, 1971, p. 226.

In 1961 approximately half of the Canadian women who worked were married and approximately half of these had children under 16 years of age living at home (Canada, Dept. of Labour, 1964, p. 22). This evidence is similar to the American situation and supports the notion that a new type of female life pattern is emerging in developed countries: the woman quits work sometime after marriage, has her family, then returns to the labor force at some later time. In the United States, female labor force participation has increased greatly since 1900, but the 20 to 24 year age group was always the peak female employment age. In 1960, however, the participation rate of women aged 45 to 54 surpassed that of the 20 to 24 group. The female labor force participation curve is now bimodal, with 44.8% of women aged 20 to 24 and 47.4% of women aged 45 to 49 in the labor force (Oppenheimer, 1970, pp. 7-9). Participation rates for all ages increased from 20.0% in 1900 to 25.8% in 1940, to 29.0% in 1950, and to 34.5% in 1960, again showing the fastest increases in the most recent time period (Oppenheimer, 1970, pp. 7-9). Corresponding to the Canadian experience, the labor force participation of married women with husbands present has increased much more than that of single women between 1950 and 1960, for all age groups, except the 65 and over (Oppenheimer, 1970, p. 11). In addition, the greatest increases for married women with husbands present from 1951 to 1963 were for women with children at home, as Table II shows.

TABLE II

WORK RATES OF MARRIED WOMEN, HUSBAND PRESENT,

BY PRESENCE AND AGE OF CHILDREN,

UNITED STATES: APRIL 1951 AND MARCH 1963

Child Status	Percentage in the Labor Force	
	1951	1963
Total	25.2	33.7
No Children under 18	31.0	37.4
Children 6 - 17 only	30.3	41.5
Children under 6	14.0	22.5

Source: Oppenheimer, 1970, p. 14.

Thus, the contribution of married women, especially those with children, to the labor force is increasing in importance. It must be remembered, however, that rural wives working on the family farm are seldom recorded by census publications as labor force participants, although traditionally they have worked. Some of the increase in female labor force participation in recent years may thus be due to the decrease in farm population and the coincident shift of unpaid female farm workers to more easily recorded types of employment.

Association Among Independent Variables

In addition to the general statements made in the discussion of demographic transition theory concerning associations between the indicators of economic development employed in this study, several authors have studied the interrelations of two or more of these variables in greater detail. From the descriptions of stages of demographic transition made by Lee-Jay Cho, Wilson Grabill and Donald Bogue, one would anticipate positive associations between degree of urbanization, industrialization and income and negative associations between each of these and infant mortality rate (Cho *et al*., 1970, pp. 282-284).

The correlations between all four of these variables, as well as other indicators of economic development, were examined in a United Nations study of conditions and trends in fertility in the world. The correlations between pairs of these variables ranged from 0.53 between infant mortality rate and percentage of economically active males in non-agricultural activities to 0.70 between urbanization and annual income per head in U.S. dollar equivalent. The signs of these correlations were not reported (United Nations, 1965, pp. 145-147).

An earlier United Nations publication discussed factors affecting infant mortality, among which were income, urban-rural residence and industrialization. This study reported that infant mortality was negatively associated with economic levels and with

fathers' income and socio-economic status, stating that income, occupation, housing, malnutrition and medical care all had effects on infant mortality. Agricultural and industrial revolutions have led to better standards of living, income, housing, clothing, etcetera, all of which, in turn, lead to a decline in mortality. Although the early effects of industrialization may have increased the mortality of factory populations, the role assumed by governments in establishing policies concerning conditions of work corrected the abuses which developed. The increased prosperity brought about improvements in sanitation, medical knowledge, education, and public health, all of which helped reduce mortality in western countries. As usually happens, the greatest declines in mortality occurred among infants and small children. Prior to the twentieth century, infant mortality, and all mortality, was higher in cities, but this difference has diminished and examination of more recent trends did not clarify the nature of the association between infant mortality and urbanization (United Nations, 1953, pp. 65-70). This lack of clarity may be due to the fact that aggregate data for urban areas conceal the frequent tremendous variation of infant mortality between areas within a city.

David Heer also examined the relationship between infant mortality and economic development. He concluded that part of the negative association he found might be spurious: infant

mortality is strongly related to mortality and morbidity at adult ages, and high morbidity among adults impedes economic development. Heer stated that at least part of the association, however, was due to the effect of economic development on infant mortality directly, because public health facilities cost money, which would not be available without economic development (Heer, 1966, p. 440).

The anticipated positive association between industrialization and income was also supported, although the expected direction of effect was reversed, in Colin Clark's thesis concerning the effect of income on industrial and occupational trends in developing societies. Clark postulated that, as real per capita income increases, the relative demand for agricultural products falls and the relative demand for manufactured goods rises, then declines in favor of services. Since productivity in agriculture and manufacturing tends to increase more quickly than does productivity in service industries, the proportion of the labor force involved in agriculture and manufacturing declines. Thus, as the economy develops and income rises, the major involvement of the labor force shifts from primary to secondary, and finally to tertiary industry (Oppenheimer, 1970, pp. 153-154).

The associations between the indicators of economic development used in this study and sex ratio are mentioned by Donald Cowgill in his discussion of transition theory. Cowgill stated

that underdeveloped areas are characterized by high fertility and mortality, agrarian occupations, rural residence, predominance of young people and a high masculinity ratio. As a nation develops, mortality and fertility decline, the population ages, there is a shift from agrarian to industrial occupations and from rural to urban residence, and the sex ratio drops (Cowgill, 1970, pp. 631-632). In support of this theory, Chester Hunt's hypothesis that industrialization promotes the demand for female labor in non-agricultural sectors of the economy, and that this is reflected in low urban masculinity ratios, was born out for the United States (Hunt, 1970, p. 308).

Reported associations between child parity of women and the other independent variables will not be considered in this section because cumulative fertility or parity is in actuality an alternative measure of fertility. It can be expected to behave similarly to fertility rate under the influence of other economic and demographic variables. Studies involving child parity and the other variables of the present study will be reported along with studies involving measures of current fertility and these variables.

Associations Between Indicators of Economic Development and Fertility

In discussing the effects of economic development in general

upon fertility, Heer described the views of two schools of theorists regarding this relationship. First, the demographic transition theory suggests a general negative association between fertility and degree of industrialization. This position was supported by the lower fertility of social classes having the highest incomes in most nations during recent years. From this, one might expect that as the income of the lower classes increases in the future, their fertility will drop. The second theory of economic development, introduced by Malthus, argues that economic development will cause a general rise in fertility. The increase in demand for labor as industry develops will cause an increase in proportions marrying, a lower age at marriage and thus higher fertility. Critics of Malthus have attributed the acceleration of population growth during the industrial revolution in England to lowered mortality rather than increased fertility, but historical demographers have recently produced evidence suggesting that fertility did increase during the periods of industrial revolution in England and the Netherlands (Heer, 1966, pp. 423-424).

Heer then discussed the findings of recent studies regarding this association. There is evidence in the United States between 1919 and 1937 that marriage and birth rates increased when business conditions improved. An article by Easterlin, cited by Heer, hypothesized that the American baby boom of the 1950's

was substantially due to the high wage level at that time of labor force members aged 20 to 29. This high income was due to the restricted size of this group as a result of low birth rates during the Depression, coupled with a high labor demand, and to the educational superiority of this group over older labor force members at a time when educational qualifications of employees increased in their importance (Heer, 1966, p. 425).

A study by Heer and Turner, cited by Heer, of eighteen Latin American countries, using multiple regression of local and national proportions urban, local and national proportions literate, and local and national proportions of the labor force in agriculture, found that these six variables, taken together as a measure of economic development, were inversely related to fertility. When actual fertility and that predicted by the six correlates of economic development were compared, Heer discovered that the areas with higher actual fertility fell mostly in nations which had experienced unusually high advances in per capita income, whereas those areas with lower fertility than predicted, fell largely in nations where increase in per capita income had been slow. From these findings, Heer hypothesized that rapid increase in level of economic development leads to increased fertility, other things being equal. Optimism toward future economic status leads couples to increased fertility. The increased economic development also leads to increased knowledge

and use of birth control and higher net economic cost of children, however, and these influences tend to lower fertility. In the long run, Heer suggested, the forces depressing fertility are stronger than those increasing it, leading to an eventual decline in fertility as industrialization increases (Heer, 1966, p. 426).

Heer cited further studies reporting positive associations between fertility and per capita income, controlling for other variables. One study cited, of thirty countries in 1953-1954 concluded crude birth rate and mean per capita income to be positively correlated, controlling for proportion of population on farms and infant mortality (Heer, 1966, p. 427). Another study cited by Heer, of thirty-seven countries, examined the effects of per capita income, level of education, proportion of the labor force outside agriculture, and population density on fertility within seven age groups. Positive coefficients were found for the regression of income on fertility, for all age groups, while negative coefficients were found for each of the remaining variables on fertility, for all age groups. Since this study did not report either partial correlation coefficients or standardized regression coefficients, Heer calculated t ratios by dividing the regression coefficients by their respective standard errors and used these t ratios as approximate measures of the strength of the partial associations of each independent variable on fertility. He found that level of education was

most strongly associated with fertility at each age, followed generally by population density. Per capita income was important for fertility of women under twenty-five, and percent of the labor force outside agriculture was important for fertility of women over forty (Heer, 1966, p. 427).

From the findings of these studies Heer concluded that if economic development has a positive direct effect on fertility, then findings that fertility declined over the long run in all present day industrial societies as income increased must be explained by negative associations between fertility and other variables positively associated with income. Education level was felt to be one of these variables because it increased communication, especially of birth control technology and information, and because it kept more young adults in school, which might cause the postponment of marriage and childbearing (Heer, 1966, p. 428).

Infant mortality rate, another indicator of economic development which Heer discussed, was strongly and negatively associated with per capita income and affected fertility positively, for several reasons. A decline in infant mortality raises the economic cost of a family under constant fertility, because more children survive, thus providing inducements to curb reproduction. High infant mortality may also cause women to bear more children to assure the survival of a desired number, whereas if infant

mortality is very low, mothers can restrict births to the number of children they desire as adults. Other factors of economic development that could lower fertility indirectly are institutional changes that increase the reliance of the elderly on government and business pensions rather than on kin, which removes the need for children as security for old age, and the increased social mobility with attendent shifts from ascribed to achieved status, which stress individual rather than family achievement and goals (Heer, 1966, pp. 429-430).

In concluding his discussion of previous research findings, Heer stated:

> "One may therefore predict that the zero-order association between economic well-being and fertility is inverse but the partial association, holding constant the indirect effects of changes in economic well-being, is positive." (Heer, 1966, p. 430).

He further hypothesized that increased economic well-being would produce an increase in education level and a decrease in infant mortality level and that, holding other relevant variables constant, the partial associations between level of economic well-being and education would be positive and those between level of economic well-being and infant mortality would be negative. Using data for forty-one countries in the early 1950's, Heer examined the associations between general fertility rates for males aged 15 to 54, estimated average per capita income, ages 15 to 64, newspaper circulation per 1,000 population 15 years and over (education

index), and mortality of infants under one year, employing population density and recent percentage increase in per capita energy consumption (as an index of magnitude of recent change in level of economic development) as control variables (Heer, pp. 431-432). He concluded that

> "...the direct and indirect effects of economic development, taken together, cause fertility to decline with an increase in economic development... [but] the direct effect of level of economic development on fertility is positive" (Heer, 1966, p. 438).

The first part of this hypothesis was supported by significant zero order correlations between fertility and economic development. The second part was supported by slight multiple and partial correlations. Heer also found significant positive correlations between infant mortality and fertility. Population density was concluded to have an important negative association with fertility, possibly because higher population density affects the net economic cost of children relative to other consumer commodities by increasing the cost of living space, required for raising children.

Heer's final conclusions were that economic development does not by itself reduce fertility. For this reduction to occur, changes in the social structure -- which usually accompany industrialization in some degree -- are also necessary. Variations in health standards, especially as these affect infant mortality,

and in education levels of the population are inversely determinative of variations in fertility even among countries with equally developed economies (Heer, 1966, pp. 440-444).

Ansley Coale reported several generalizations, considered universally valid by some demographers, concerning circumstances under which neo-Malthusian fertility reduction occurs, some of which were very similar to Heer's conclusions. First, declining mortality means that more children survive, so fewer births are required. Second, the cost of children increases but their economic advantages to the family decline in urban and industrialized societies. Third, increased status of women as more become educated and employed increases use of birth control. Finally, religious changes and secular, rational attitudes favoring voluntary fertility control are seen as a natural part of industrialization and modernization (Coale, 1967, p. 208).

A study by Friedlander and Silver, using data for 18 developed, 20 intermediate and 47 underdeveloped countries, examined the effects of several variables on levels of fertility. Income was found to have a positive effect on fertility in developed countries, but a negative effect in underdeveloped countries. The authors used the "extent of the agricultural population" as a negative indicator of urbanization -- which could also be considered as an inverse measure of industrialization -- and found this measure to have a positive effect on fertility. They also found that

population density, which is greater in urban areas, was negatively associated with fertility (Friedlander and Silver, 1967, pp. 44, 53-54). It is anticipated that similar, although smaller, differences might be found in the present study between states and provinces experiencing greater and lesser degrees of economic development, as differentiated by extent of primary industry and urbanization.

A United Nations report on fertility discussed the associations of twelve economic and social factors with differences in level of the gross reproduction rate of different countries. Four of the indicators of economic development were estimated income per head (U.S. dollar equivalent), urbanization (percentage of population residing in localities of 20,000 or more inhabitants), percentage of economically active males engaged in non-agricultural activities, and infant mortality rate. The distributions of all countries, countries with high fertility, and countries with low fertility, were examined by levels of these economic indicators. The distribution of countries with low fertility fell at a higher range of income, urbanization, and participation in non-agricultural activities, and at a much lower range of infant mortality than did the distribution of countries with high fertility. Thus, the countries with lower fertility had higher income, lower infant mortality, and a greater degree of urbanization and industrialization than the countries with higher fertility (United Nations,

1965, pp. 134-136).

An earlier report from the United Nations discussed the association between urbanization and fertility decline. The report postulated that the more rapid decline of fertility in cities may be due to the closer contact of the lower social classes with the upper classes which are the first to practice family limitation. The decline in fertility is probably not due to urbanization alone, but to the complex of factors associated with it, known as "civilization". Thus, as capitalism and civilization penetrate agriculture, the rural population also begins to practice family limitation. The article stated that "the decline in fertility has been preceded and accompanied in all countries by a great shift of the population from the country to the city," and suggested that the greater family sizes of rural over urban populations in many countries reflects the idea that an urban mentality, not just urban residence, causes fertility decline (United Nations, 1953, pp. 77-78).

Associations Between Sex Ratio and Fertility

Although no specific references to sex ratio as a determinant of fertility were encountered in the literature, the dependency of certain other factors affecting fertility on sex ratios seems fairly obvious. Without reasonably high masculinity ratios, average age at marriage will likely be high and the proportion of

women ever marrying will certainly be low. Age at marriage and proportion of female population marrying are fundamental determinants of fertility in most societies (Hawthorn, 1970, p. 19). "In countries where fertility is high, marriage of women occurs at an early age and is nearly universal" (United Nations, 1953, p. 93).

Associations Between Cumulative and Current Fertility

In a society where the average parity of women is high, most women will have born at least one child (United Nations, 1953, pp. 91-93). This gives some support to the notion that fertility rates in an area should be positively associated with the proportion of women having large families. That is, in an area where almost all fecund women are bearing at least one child and most are bearing several, throughout their reproductive lives, the fertility rate in any given year is likely to be higher than that in an area where more women remain childless and fewer reach high parity.

An interesting change in American patterns of cumulative fertility, which affect current fertility, has occurred in recent decades. In the past, although many couples had very large families, couples with no children or only one child were also common. The proportions of couples with very large families have declined in recent decades, but voluntary childless-

ness has almost disappeared as well. Most couples now want, and have, two, three or four children, and the average family size has actually increased over what it was for "depression wives" (Population Reference Bureau, Inc., Aug. 1966, pp. 66-70). Thus, extremes in family size are now less common, and most couples have moderate-sized families.

Associations Between Indicators of Economic Development and Female Labor Force Participation

Some reference to the positive effect of economic development on participation of women in the labor force has already been made in the preceding discussion of the factors involved in economic development and their effects on fertility. Industrial development has shifted production from the family to the factory and reduced the emphasis of the labor force on production in favor of distribution and service functions. Technological advances which made factory production of food and clothing more economical than home production reduced women's economic function in the home but increased the monetary needs of the family to purchase goods previously produced at home. Cultural change has thus given women more free time and added incentive to work while providing more female job opportunities in the extended service and clerical fields. The decline in family size and the shift to a more egalitarian or "person-centered" family philosophy

have also added to the employment of married women (Nye & Hoffman, 1963, pp. 3-6).

A recent examination by the United Nations of female labor force participation in fourteen industrial and twelve agricultural countries found much greater labor force participation of young women, aged 15 to 30 in the industrial countries than in the agricultural countries. The trends, however, for most of the industrial countries studied show a transition from the type of age specific female labor force participation curve formerly characteristic of industrialized countries (highest participation for youngest age groups) to a relatively new type, displaying a second peak for middle-age groups. The United States represents the extreme form of this curve, with participation rates of middle-age women exceeding those of young women. The article postulated that the large scale expansion in married female employment in the United States between 1900 and 1950 was associated with economic and cultural developments such as technological innovations which lightened housework chores, the gradual reduction of the work week, and the increase of clerical and sales jobs. All these factors were also operative in the other industrialized countries studied, but did not always have the same profound effects (United Nations, 1962, pp. 21-44).

Looking at the effects of income on female labor force participation, Oppenheimer reported on two studies correlating

employment with real earnings for thirty-eight American cities. The first study, by Paul Douglas, dealing with 1920 and 1930 statistics, found for both years that the higher the average real earnings in a city, the lower the overall rate of labor force participation of men and of women separately, with the negative correlation for women being stronger (Oppenheimer, 1970, p. 28). When a second author, Clarence Long, extended this analysis to 1900, 1940 and 1950, using the same cities, similar results were found, except for 1950. In 1950 the negative correlations disappeared and slight positive correlations appeared. Long stated that because these were ecological correlations only, the sequence of events leading to the positive correlations was unclear. When Long correlated the labor force participation of individual women with the incomes of their husbands, he arrived at negative correlations for all groups: white or non-white, young or older, and with or without young children at home (Oppenheimer, 1970, pp. 28-29). A Canadian study of married female employment supported this negative correlation on the individual level: the married woman was less likely to work the higher her family income, exclusive of her own earnings. This study also supported a positive association between female employment and urbanization, at least for married women: married women were more likely to work, the larger the urban center in which they resided (Spencer and Featherstone, 1970, pp. 82, 85).

More definite evidence of this association was provided by Sylvia Ostry. Labor force participation was much greater for urban women, for all ages. Reasons presented to explain this differential related to the types of jobs available in the city in white collar, trade and service occupations, versus the more conservative social attitudes, higher birth rates, and lack of household conveniences in rural areas. The re-entry of middle-aged married women into the labor force was primarily an urban phenomena which did not occur in rural farm areas in Canada in 1961 or in the United States in 1950. In the United States in 1960, however, even the labor force participation of farm women increased for the middle-aged groups, suggesting that they too are beginning to re-enter the work force when their family committments are reduced. This could reflect the growing urbanization of American farm communities (Ostry, 1968, pp. 12-14).

Although no specific references to the effect of infant mortality rates on female labor force participation were discovered in the literature, the substantial evidence relating infant and general mortality declines to economic development, and the corresponding reports of expanding female employment as industrialization and urbanization occur, suggest that level of infant mortality would have a negative effect on female employment.

Associations Between Sex Ratio and Female Labor Force Participation

No direct references to the association between sex ratio and female labor force participation were found in the literature. Masculinity ratio was negatively associated with economic development, however, (Cowgill, 1970, pp. 631-632) and previously cited research found economic development to be positively related to female employment. These associations, combined, suggest a negative association between masculinity ratio and female labor force participation.

Associations Between Fertility and Female Labor Force Participation

Opinions vary with respect to the existence, direction and explanation of relationships between fertility and female labor force participation. The existence of a strong relation between these variables is generally accepted in modern societies, but has been rejected by some international studies. A survey of international data and literature up to 1950 by the United Nations concluded that studies of female labor force participation have not established that increased female employment affects family size (United Nations, 1953, p. 79). Murray Gendell reported that in cultures where wives were encouraged to enter

the labor force and where birth control is widely practiced, -- that is, in economically developed countries -- labor force activity is affected by child bearing activities. In developing countries, however, the evidence available suggests little or no association between economic activity and family size, perhaps because most female employment in traditional societies involves agriculture or handicrafts, which are conducted in the home and thus are not greatly hampered by fertility (Gendell, 1967, pp. 285-286).

For Western developed countries, the existence of a strong association is agreed upon, but the direction of causation is disputed, as was mentioned earlier in this chapter. The data for developing countries suggest that a certain level of economic development may be necessary before the relationship between fertility and female employment emerges. A study of female working roles and fertility in Turkey supports this idea. No differences in fertility, age or social class were found between the few women who worked and those who did not. The explanation was suggested that differential fertility by labor force status will appear only when the roles of mother and worker are incompatible. In underdeveloped areas where few women work and most employment is on a family farm or in a cottage industry, it is easy to combine these roles. Even in the urban areas of underdeveloped countries, so few women work that those who do

can find abundant cheap help available for child care (Stycos and Weller, 1967, pp. 214-216).

Andrew Collver found negative correlations between the female labor force participation rates and the child-woman ratios of 412 metropolitan areas in eight countries. These ecological correlations by country, circa 1950, were strongest for Canada, Italy, Brazil, the United States, then England and Wales. The correlations remained when proportion of women married was controlled by partial correlation, although all except those for Canada and Italy were weaker. In the same article, Collver reported his findings for 65 Standard Metropolitan Statistical Areas in the United States, 1960. Correlations between female labor force participation and three measures of fertility -- number of children ever born (parity), the child-woman ratio, and 1960 birth rate -- were examined. Significant negative correlations were found between proportion in the labor force and all three fertility measures for all white women, those ever married, and for all age groups between 20 and 39. Similar, but weaker, correlations were found for non-whites. Collver assumed the direction of causation, stating that a high rate of female employment tends to reduce the birth rate in a community, and that the industrial structure of the community and needs of employers are more important than the population composition for determining the proportion of women working

(Collver, 1968, pp. 56-59).

The opposite direction of causal linkage between fertility and economic activity was supported by John Allingham. He stated that not only is family size declining, but patterns of child spacing are changing. The child bearing period has become more compressed, in Canada as well as in the United States, due to the decline in child bearing after the mid-thirties. A result of these fertility changes is the "emancipation" of most women, by their late thirties, from child bearing and from much of their child care responsibilities, once the youngest child enters school. This, along with economic and technological changes, results in less need for the mother to be in the home, and thus allows her to return to the labor force (Allingham, 1967b, p. 13).

Two studies differentiating extent of commitment to the labor force, measured differently, found negative associations between this factor and fertility. One, differentiating between full-time and part-time labor force participation in the United States, found that fertility of women not in the labor force was higher than that of women with part-time jobs, but that women with part-time jobs had higher fertility than those with full-time commitment to the labor force. Of native white women, those with full-time jobs had only one-third the fertility of those not employed. This association remained constant when

controls for age, education and presence of husband were introduced. The same pattern existed for urban and rural areas, but all fertility was lower in the urban areas (Cho et al., 1970, pp. 177-181). The Swedish census of 1935-36 studied differences in family size in relation to the wife's economic activity over her entire married life, rather than just at the time of the census. Married women with full-time employment throughout their married life had far fewer children and greater childlessness than those never employed. The fertility of women with intermediate employment histories ranked between these extremes. Similar results were found for all income and social class groups (United Nations, 1953, p. 89). Although none of these studies established, irrefutably, the direction of causality, they did establish the definite existence of a negative association between fertility and female labor force participation, at least in developed countries.

RESEARCH PROPOSITIONS

The research propositions are generally drawn from the cumulative findings of the literature studied. The literature generally supported the choice of urbanization, industrialization, income and infant mortality as indicators of economic development. Several authors discussed economic development in terms of increased urban residence, secondary and tertiary industry, per

capita income and decreased infant mortality. Both current and cumulative measures of fertility have been found to decline as the economy of a country developed, and both were found to be lower in more developed areas. References to the relationship between measures of fertility and the individual indicators of economic development were mainly in keeping with the more general findings, although exceptions were noted for some studies.

Female labor force participation has been found to increase with economic development. Recorded female employment was higher for urban, industrial societies, but it must be remembered that female laborers inside family farm and cottage industries are often underenumerated by censuses. Studies of the association between female labor force participation and the individual indicators of economic development were mainly in keeping with the general findings, although no references to direct association between infant mortality and female employment were discovered. Studies of fertility and female labor force participation found these variables to be negatively related, although opposing assessments of the direction of causality between them were offered.

Discussions of sex ratio, as related to any of the other seven variables to be considered in the present study, were minimal in the literature. Some discussion suggested that the

masculinity ratio, like fertility, declines as the economy progresses, but the association between sex ratio and both fertility and female labor force participation was not documented.

The present study will provide a somewhat different investigation of factors affecting fertility and female labor force participation than has been found in the literature consulted. The present analysis will employ aggregate measures of the pertinent variables for provinces and states in Canada and the United States, rather than measures of individual characteristics or of national, city, or other aggregate data. The combination of factors chosen as independent variables for the present study, and the method of analysis, are also slightly different than those used in previous studies.

The six factors which will be treated as independent variables in the regression analysis are the four indicators of economic development -- degree of urbanization, proportion of the labor force in primary industry, median income, and infant mortality rate; sex ratio; and proportion of women bearing four or more children. In addition, fertility rate and female labor force participation rate will each be treated as an independent variable in the regression analysis of the other. The indicators of economic development and sex ratio have logical sequential priority to the dependent variables, current fertility and female labor force participation rates. For example, the degree

of urbanization in an area, or its median income, could not be affected by the fertility rate in that area in a given year, because the levels of these factors for that year were established before the births of that year occurred. Similarly, the sex ratio of an entire state could not be much affected by the birth rate or by the proportions of females employed in a given year.

Although regression analysis assumes asymmetric relationships between variables, causal assessment cannot be the main focus of the findings because the data studied involve only ecological correlation. The use of aggregate data precludes a true causal interpretation. Thus, it could not be stated that lower fertility causes female labor force participation, or more extremely, that a woman with no children will work but one with four or more children will not. Statements such as women who live in large urban centers, or whose husbands earn more than $5,000 annually, will work must also be avoided. Instead, on the state or provincial level, these types of relationships should be discussed as follows. If an area has low fertility, then more women are likely to work; that is, the fertility of an area has a negative effect on the female labor force participation of that area. Degree of urbanization and median income in an area have positive effects on female labor force participation; that is, the proportion of women who work will be greater in states which are

highly urbanized and have high median incomes.

Associations Between Independent Variables

Correlations between pairs of independent variables will be examined. Asymmetric relationships between the indicators of economic development will not be assumed because there is no logical basis for assessing the sequential priority between the independent variables, within the areas presently under study, as exists for these variables in relation to fertility and female labor force participation. Although causal direction of these relationships might be established through historical evaluation, such an endeavor is not within the scope of the present study.

Proposition 1. Degree of urbanization and median income will be positively correlated. These variables are considered to be positive indicators of economic development. As an area becomes more economically developed, its population shifts from rural to urban and its wealth, usually measured by per capita income, increases. Median income was substituted for per capita income in this study because per capita income figures were not available for provinces and states within Canada and the United States. Median income may actually be a better measure of the wealth of an area than is per capita income. The median is not influenced by a few extreme cases, as is the per capita measure,

which is essentially a mean or average.

Proposition 2. Proportion of the labor force in primary industry and infant mortality rate will be positively related. These variables are considered to be negative indicators of economic development. As an area becomes more economically developed, its labor force shifts from predominantly agricultural, primary industries to production and service, or secondary and tertiary industries. Also, as the economy develops, health standards improve and infant mortality declines.

Proposition 3. The positive indicators of economic development, degree of urbanization and median income, will be negatively related to the negative indicators of economic development, proportion of the labor force in primary industry and infant mortality rate. Thus, degree of urbanization will be negatively correlated with proportion of the labor force in primary industry and negatively correlated with infant mortality rate. Median income will be negatively correlated with proportion of the labor force in primary industry and negatively correlated with infant mortality rate.

The relationships hypothesized in these three propositions are supported by research findings discussed in the preceding survey of related literature.

Proposition 4. Masculinity ratio and proportion of women bearing four or more children (high parity) will be positively related.

Although no specific references concerning the relationship between sex ratio and high parity were discovered in the literature, discussions of high masculinity ratios and large family size as elements of economically underdeveloped areas were encountered.

Proposition 5. Masculinity ratio and high parity will be negatively associated with level of economic development. These variables will, therefore, be positively related to the negative indicators of economic development, extent of primary industry and infant mortality. Masculinity ratio and high parity will thus also be negatively related to the positive indicators of economic development, degree of urbanization and median income.

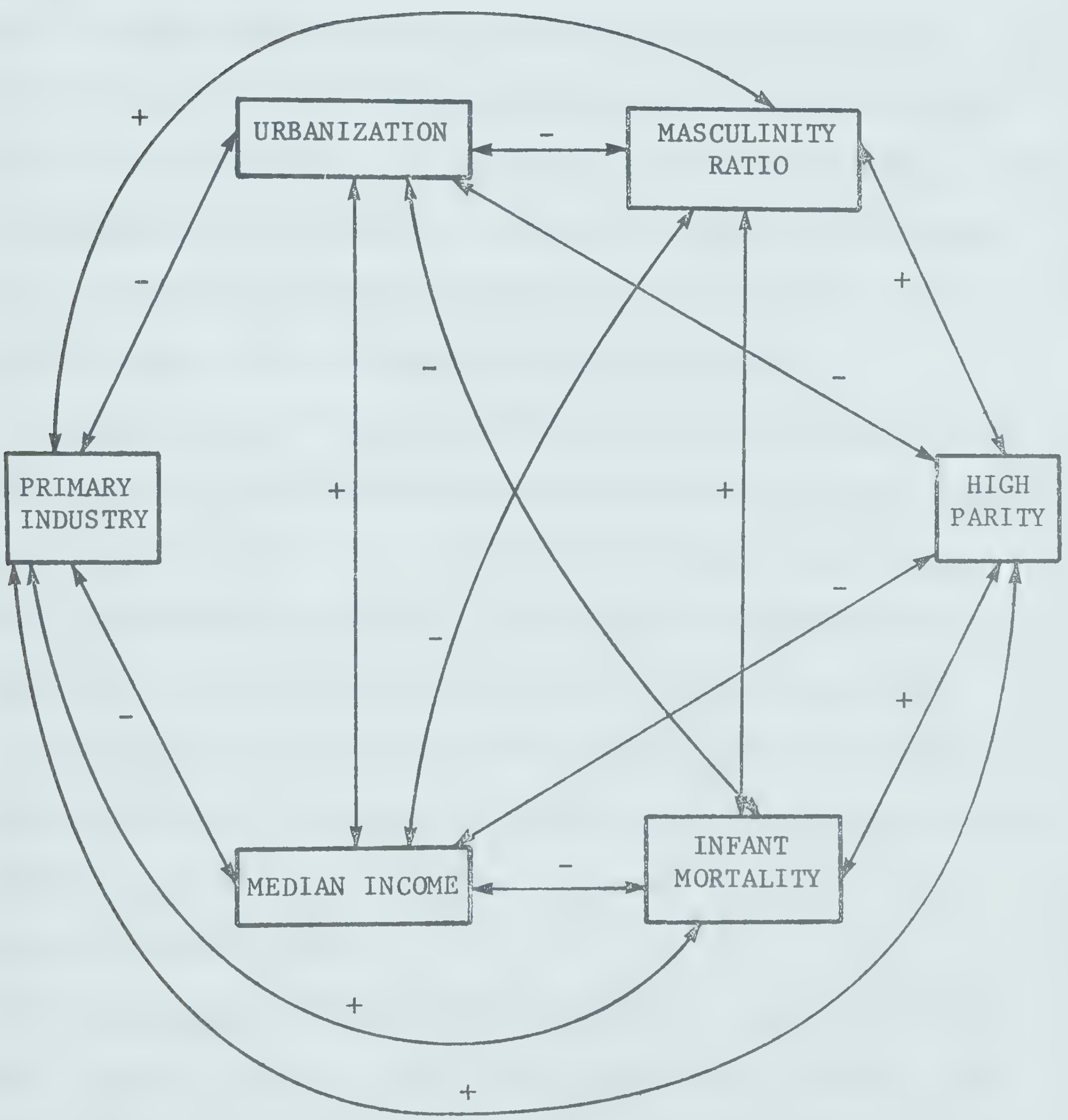
The anticipated correlations between these six variables are illustrated in Figure 1.

Associations Between Independent Variables and the Dependent Variable Fertility

The direct effects of the six independent variables and female labor force participation upon fertility will be examined through regression analysis. Asymmetric relationships are assumed between the independent variables and fertility. The direction of causal effect between fertility and female labor force participation has never been satisfactorily resolved. With this in mind, female labor force participation will be included in the regression analysis of fertility, and fertility will be

FIGURE 1

ANTICIPATED CORRELATIONS BETWEEN INDEPENDENT VARIABLES



included in the regression analysis of female labor force participation.

Proposition 6. A negative relationship will be found between fertility and female labor force participation. The economic and demographic factors affecting fertility and female labor force participation will affect these variables such that they will vary inversely, one with the other. Whether or not one of these variables will have a significant direct effect on the other, in the presence of the other independent variables will be assessed by the regression analysis but cannot be speculated here. Conflicting evidence regarding the direction of causality between these variables has already been presented.

Proposition 7. The positive indicators of economic development, degree of urbanization and median income, will each have a negative direct effect on fertility rate. Thus, areas that are still predominantly rural will be expected to have higher fertility than areas where more of the population is highly urbanized. Areas with lower median incomes will also be expected to have higher fertility than more wealthy areas, although recent research findings have cast some doubt on this relationship, as indicated earlier in this chapter.

Proposition 8. The negative indicators of economic development, extent of primary industry and infant mortality rate, will have positive direct effects on fertility rate. Areas where an

agrarian economy is still fairly important will have higher fertility than will areas where the economy is more totally dependent on manufacturing and service industries. Infant mortality rate will affect fertility positively, both as a negative indicator of economic development and as a demographic factor in itself: where more infants are dying, more births will be necessary to achieve the completed family size desired.

Proposition 9. Masculinity ratio and the proportion of women reaching high parity will have positive direct effects on fertility rate. High masculinity ratios and large families are associated with agrarian societies and traditional family values. Since parity is a measure of fertility history, it seems probable that an area where large families are more prevalent will also have higher current fertility. Similarly, in an area where masculinity ratio is high, more women will be married, and more married women will be living with their husbands, so both total and legitimate fertility rates will likely be higher.

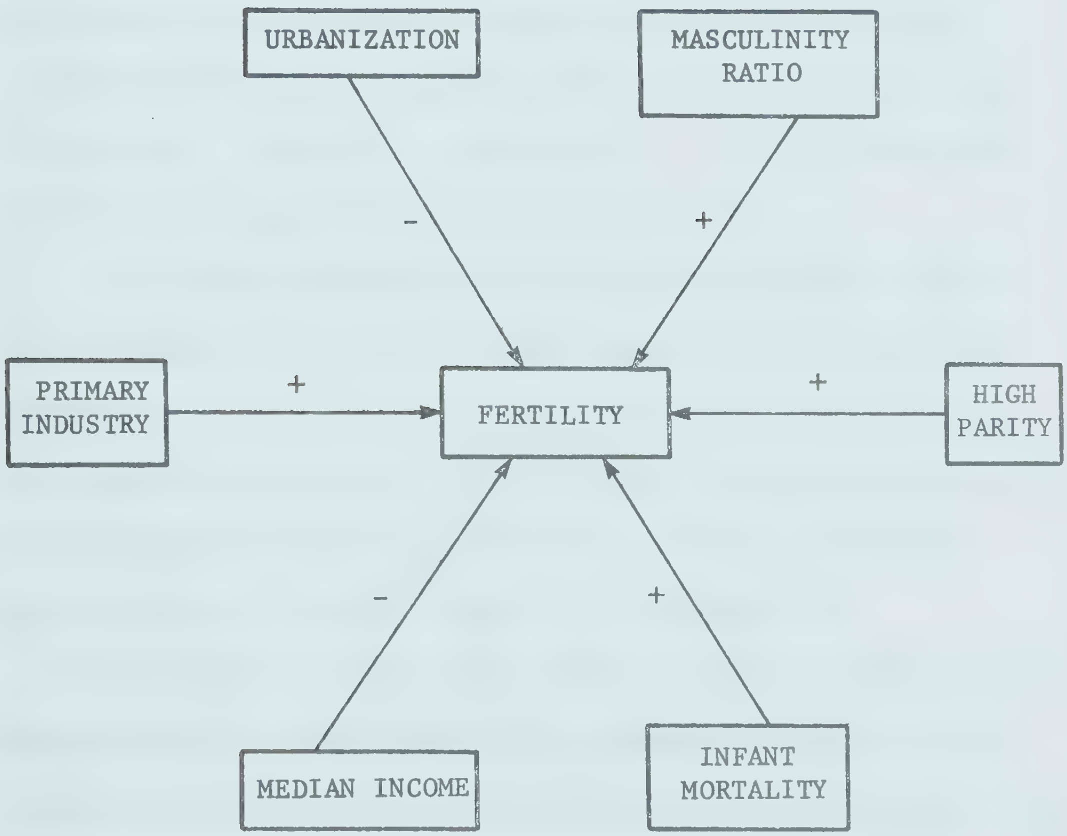
The anticipated direct effects of the independent variables on fertility are illustrated in Figure 2.

Associations Between Independent Variables and the Dependent Variable Female Labor Force Participation

The direct effects of the six independent variables and fertility upon female labor force participation will be examined

FIGURE 2

ANTICIPATED PATH COEFFICIENTS, FERTILITY AS DEPENDENT VARIABLE



through regression analysis. Asymmetric relationships are assumed between the independent variables and female labor force participation. Fertility will be included in the regression analysis of female employment, as previously discussed.

Proposition 10. The positive indicators of economic development, degree of urbanization and median income, will have positive direct effects on female labor force participation rate. A state or province that is highly urbanized is likely to experience greater participation of women in the labor force than a more rural state. Similarly, a wealthy area is likely to have more women in the labor force than is a poor area.

It has been suggested that extensive female labor force participation will lower the median income of an area because women tend to earn less than men. The present study, however, will examine the direct effect of median income as an indicator of economic development on the extent of female labor force participation in an area, rather than the opposite.

Under this focus the above statement may be countered by suggesting that in an economically developed area where median income and female labor force participation are high, more males (and females) will be employed in high-income occupations. Thus, female employment rates will be positively associated with median income.

Since the present study deals with ecological correlations

between median income, as a positive indicator of economic development, and female labor force particiapation, the findings of negative atomistic correlations between family or husband's income and female employment in the literature were not disconcerting. Because the present study examines associations between levels of economic development, fertility and female employment, rather than associations between individual measures of these variables, ecological correlations are appropriate and the use of individual correlations would be an 'atomistic fallacy' (Heer, 1966, p. 430).

Proposition 11. The negative indicators of economic development, extent of primary industry and infant mortality, will each have a negative direct effect on female employment rates. A highly industrialized state or province, where infant mortality is low will experience higher rates of female labor force participation than one that is still heavily dependent on primary industry or one where infant mortality is still high.

Proposition 12. Masculinity ratio and the proportion of women bearing four or more children will have negative direct effects on female employment rates. Areas having relatively high proportions of women with large families are likely to have retained other traditional values as well, which, in conjunction with the added home responsibilities of the women having large families, would tend to restrict the participation of women in

activities outside the home. Similarly, areas with high masculinity ratios will provide sufficient numbers of marriageable males and males to fill bisexual occupations so that more females can marry and fewer will be required by employers. The opposite would hold true in areas with low proportions of high parity and low masculinity ratios.

The hypothesized direct effects of the independent variables on female labor force participation are illustrated in Figure 3.

SUMMARY

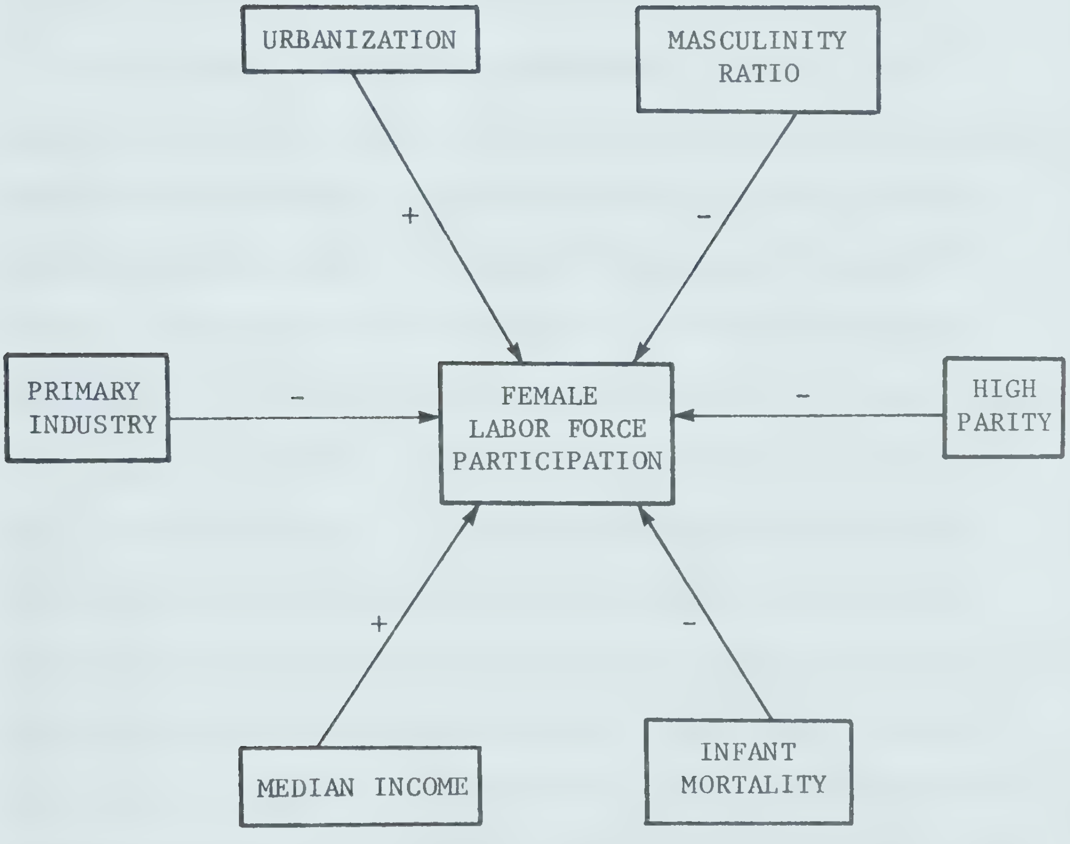
This study will examine the relative importance of certain factors in explaining variations in fertility and female labor force participation within Canada and the United States. The variables to be studied are four indicators of economic development -- degree of urbanization, median income, extent of primary industry, and infant mortality rate -- and two other factors thought to be associated with development -- sex ratio and proportion of women having four or more children (high parity).

A survey of recent literature in the field supported the expectation of a negative association between fertility and female labor force participation but did not resolve the causal direction operating between these variables. Generally, the demographic transition and economic development of a country have been characterized by several fairly universal changes which tend over

FIGURE 3

ANTICIPATED PATH COEFFICIENTS,

FEMALE LABOR FORCE PARTICIPATION AS DEPENDENT VARIABLE



time to reduce fertility and increase the participation of women in economic activities outside the home. The shifts from rural to urban residence and from primary to secondary and tertiary industry, the decline in mortality, especially of infants, the increasing social and physical mobility, population density, education, standard of living and per capita income, all tend to affect fertility and female labor force participation, either directly or indirectly, as various studies have shown.

Relationships between the independent variables were hypothesized, in addition to the hypotheses of direction of effect between each independent variable and each dependent variable. The negative indicators of economic development -- extent of primary industry and infant mortality rate -- were expected to be negatively related to the positive indicators -- degree of urbanization and median income -- and positively related to sex ratio and high parity. The positive indicators of economic development were also expected to be negatively related to sex ratio and high parity. Fertility was expected to be positively affected by extent of primary industry, infant mortality rate, sex ratio and high parity, and negatively affected by degree of urbanization and median income. Conversely, female labor force participation was expected to be negatively affected by extent of primary industry, infant mortality rate, sex ratio and high parity, and positively affected by degree of urbanization and median income.

CHAPTER II

DATA AND METHODOLOGY

Fertility and female labor force participation are affected by many variables, both demographic and economic. The effects of six of these variables will be examined within the limited range of variation found between states and provinces in two well-developed national economies: Canada and the United States. Correlation and multiple regression techniques will be utilized to discover whether or not each variable does affect fertility and female labor force participation and what the effects are.

DESCRIPTION OF THE DATA

The Population. The population studied was the total populations of the United States and Canada, taken together. Each state and province was considered as one unit of analysis. The decision to examine patterns of differential fertility and female labor force participation within two highly developed national economies was based on the assumption that differences in level of economic development and modernization would exist between areas within even a highly developed country. Some areas would not have participated as fully as others in the national industrialization and urbanization. These areas would, therefore,

retain traditional life styles and ideals -- which are assumed to be different from those of contemporary urban societies with regard to fertility and female labor force participation -- to a greater extent than would the areas which had led that country's social and economic transition.

The decision to use states and provinces as the units of analysis was made for three reasons. First, states and provinces are the basic demographic, economic, and political units of analysis utilized by the official data collection agencies of both countries. Thus, fairly elaborate data on population characteristics are available by state and province. Second, as relatively smaller areas, states and provinces should provide a somewhat greater degree of homogeneity within an area than would larger areas, such as the demographic and economic regions used in some official publications. Finally, the use of these smaller areas provides a greater number of units for the analysis, which is an important consideration in correlation and regression analysis.

Sixty units were included in the analysis: the fifty states and the District of Columbia in the United States and nine provinces of Canada. Newfoundland, the Northwest Territories and the Yukon were excluded from the analysis because available data were incomplete for these three areas.

The Source. The data used in this study were compiled from the census and vital statistics publications of each country for

as comparable a time period as possible. All Canadian data were compiled from the 1961 Census of Canada and the 1961 Vital Statistics. American data were compiled from the 1960 Census of the United States and the 1960 Vital Statistics. Detailed source identification will be made in the List of References. The discrepancy of one year between the dates of census enumeration of the two countries was unavoidable, but was not considered crucial to the present study.

DEFINITION AND MEASUREMENT OF THE VARIABLES

Fertility. The fertility measure employed in this study was the number of live births per 1,000 women aged 15 to 44, in 1960 for the United States, and the number of live births per 1,000 women ever married, aged 15 to 44, in 1961 for Canada.

The age span 15 to 44 is one frequently used in demographic considerations of fertility. Other possibilities expand one or both limits, down to 10 and/or up to 49, but data used in the present study showed little fertility below or above the age categories 15 to 44. The Canadian fertility measurement was confined to legitimate fertility because the Canadian vital statistics publications, from which current fertility data were acquired, consider legitimate and illegitimate births separately and do not report a combined figure for all births in each province.

An attempt was made to secure legitimate fertility data for

the United States as well, but legitimate fertility for each state is not reported separately from total fertility. An examination of illegitimacy ratios, however, revealed that illegitimate births, even for the age group with the highest illegitimacy ratio, were less than five per cent of all births in the United States in 1960 (U.S. Department of Health, Education and Welfare, 1968a, pp. 2-4). The unavoidable discrepancy in the measurement of fertility between Canada and the United States should, therefore, be minimal and should not significantly affect the outcome of the present investigation.

The American fertility rates were taken directly from the vital statistics publication. The Canadian fertility rates were calculated from vital statistics data on live births and census data on population.

Female Labor Force Participation. The measure of female employment used in this study was the proportion of all women 15 years of age and over who were in the labor force in Canada in 1961 or the proportion of all women 14 years of age and over who were in the labor force in the United States in 1960. Some age discrepancy is apparent in the measure for Canada and the United States. This was unavoidable due to the age breakdowns reported for each country. Canada reported labor force participation of women by five-year age groups starting with age fifteen, however, the United States reported this measure for ages 14-15, 16-17, 18-19, and by five-year age groups from age twenty on. This discrepancy was considered to be minimal, however, since only very small proportions of fourteen and fifteen year old girls were in the American labor force and few

fifteen year old girls were in the Canadian labor force. The data for this measure were drawn from the respective censuses of the two countries.

Degree of Urbanization. Slightly different definitions of metropolitan areas exist in Canada and the United States. These differences were not considered important for the present study, since the measure of urbanization desired was one of population size only. The proportion of a state's or a province's population residing in cities of 50,000 or more was taken as the degree of urbanization of that area. In the United States, this proportion was identified as the percentage of the state's population residing in Standard Metropolitan Statistical Areas, all of which must by definition contain a central city of at least 50,000 population. Every city of 50,000 inhabitants in 1960 was included in a Standard Metropolitan Statistical Area. In Canada, degree of urbanization was identified as the percentage of the province's population residing in Census Metropolitan Areas and other cities and major centers of 50,000 or more inhabitants. Data for both countries were compiled from the respective censuses.

Median Income. For the United States, median income was taken from the 1960 census reporting on income of individuals in 1959. For Canada, median income was calculated from the sample census data on total income by size for the non-farm

population, in the year ending May 31, 1961. Thus, there was some discrepancy in both time period (as with all data in this study) and population for which median income could be compiled. It was hoped that the probable slight overestimation of median income in Canada resulting from the non-inclusion of farm population would not significantly affect the relationships involving this variable. Since the measure of median income includes only persons having an income, this overestimation should be minimal.

Participation in Primary Industry. The proportion of the labor force employed in primary industry occupations was compiled from the Canadian and American censuses. No relevant discrepancies in the definitions of primary industry between the two countries were evident. Primary industry includes agricultural, fishing, hunting, trapping, and mining occupations.

Infant Mortality Rate. Infant mortality rates for states and provinces were taken from the vital statistics publications of the United States and Canada. The United States infant mortality rates were reported as the number of infant deaths per 1,000 live births, whereas the Canadian rates were reported as infant deaths per 100,000 live births, necessitating the division of the Canadian rates by 100 to make them comparable to the American rates.

High Parity. The high parity measure as defined in this

study was the proportion of women ever married, age 15 and over, having four or more children. The measure was compiled from Canadian and American census reports and was comparable for both countries. Parity is a measure of cumulative fertility or fertility history. Unlike fertility rate, which is a cross-sectional measure that can be employed only for the thirty-year age group, 15 to 44, parity is a longitudinal measure operable for all ages above 15. Parity is usually higher for older age groups, whose members have completed their fertility, and had their children in earlier decades and often under different value systems, norms and economies than those affecting current fertility.

Because parity and fertility rate are essentially two different measures of the same phenomenon -- child bearing activity, past and present -- the inclusion of the high parity measure as a possible independent variable affecting fertility involves the risk that parity and fertility overlap and thus parity is not a legitimate predictor of fertility. The inclusion of high parity in the set of independent variables being examined for their effect on fertility may therefore be inappropriate. An examination of the effects on fertility of sets of independent variables both including and excluding high parity should be made to evaluate the differences occurring through this operation.

Sex Ratio. A population's sex composition is normally described in terms of the sex ratio, which for purposes of this

study is the masculinity ratio. The masculinity ratio is defined as the number of males per one hundred females. Data for computation were taken from the Census of Canada and the United States Federal Census. These measures were comparable for both countries.

Problems of Data Measurement

Even when precautions are taken against causal interpretations that commit ecological fallacy, it must be realized that aggregate measures for areas that are not perfectly homogenious with respect to the variables under consideration will always carry the risk of erroneous conclusions. Since the effects of all interacting variables cannot be considered, or even identified, in the present study, it must suffice that the reader be made aware of the shortcomings of interpretations from aggregate data correlations.

The total infant mortality rate for Canada is greatly influenced by the extremely high infant mortality of a very small segment of the total population -- the native Indian and Eskimo populations and inhabitants of the poorest urban slum areas. As with any average aggregate measure, these small concentrations of high infant mortality seriously inflate the overall infant mortality of the entire population. It must also be remembered that the relationships between degree of urbanization and infant mortality rate, as indicators of the

economic development of an area, may be negative, even though infant mortality within a province may be higher in certain urban areas than in rural areas.

The negative association between urbanization and extent of primary industry may also be untrue for intrastate comparisons. For example, much of Pennsylvania's labor force is involved in coal mining, a primary industry, yet many of the miners live in urban areas of 50,000 population or more.

In addition to masking the intraprovincial variations by the use of macro data, certain weaknesses in census definitions of the variables under study were unavoidable. The usual census enumeration of women in the labor force overlooks many rural women who work on the family farm. The women are employed but are often excluded from the labor force because they are not earning wages for work done outside the home. It has been suggested that female labor force participation is not a new phenomenon. Throughout history, women have always worked, first in farm and cottage industries, later in the early factories, and now mainly in tertiary industries. The increase in female labor force participation in recent years, as reported by many current demographers, is mostly an increase in the employment of middle-class American women.

The overestimation of median income, which occurred because the farm population is excluded from the median income measure

in Canada, was greater for provinces which had larger rural farm populations. This differential overestimation destroyed the purity of the tests of hypotheses regarding the association of median income with other variables. Since Canada as a whole had lower income than the United States, however, the overestimation of median income in Canada added to the homogeneity of the study population with states and provinces grouped together.

METHOD OF ANALYSIS

The major purpose of this study was to examine the effects of several independent variables upon fertility and female labor force participation. For this purpose stepwise multiple regression was employed. Correlational analysis between pairs of variables was also performed in order that the symmetrical relations between variables could be examined. At a later stage in the analysis, partial correlations were introduced to assist the explanation of interaction effects discovered between some of the independent variables.

The use of these techniques of analysis necessitated certain assumptions regarding the population being studied. The associations between the variables were assumed to be linear, as Pearson's product-moment correlation and multiple regression require this assumption. It was also necessary to assume that the distributions of the values of each dependent variable for

each value of each independent variable were normal and vice-versa (that is, bivariate normality). Third, it was assumed that the variances of the distributions of values of each dependent variable were the same for each value of each independent variable (that is, homoscedasticity). If the joint distribution of each pair of variables was bivariate normal, the condition of homoscedasticity would also be met (Blalock, 1960, pp. 276-279).

In order to discover which variables were significantly related to the dependent variables when the effects of other variables were controlled for, regression equations were run for both female labor force participation and fertility.

Multiple regression shows the linear relationship between a dependent variable and a set of independent variables while taking into account the interrelationship between the independent variables. The basic concept of multiple regression is that it produces a linear combination of independent variables which correlates as highly as possible with the dependent variable so that this linear combination may be used to 'predict' values of the dependent variable. There are two uses of the regression equation resulting from the most efficient combination of independent variables: to predict values of the dependent variable from known values of the independent variables; and, more important for the present study, to provide an understanding of the relationship of each independent variable to the dependent

variable, through examination of the signs and magnitude of the regression coefficients. However, the size of the regression coefficient is a pertinent indicator of the strength of relationship between an independent and dependent variable only when the coefficient is standardized to eliminate differences in scale of measurement between the independent variables (Nie et al., 1970, pp. 174-179).

These standardized or normalized regression coefficients are called beta weights. The beta weight, β, represents the amount of change produced in the dependent variable by a standardized change in one of the independent variables, when the effects of the other independent variables are controlled (Blalock, 1960, pp. 345-347). The beta weight is asymmetrical -- it would not remain the same if the assumed causal direction were reversed. In addition, the effect of other variables in the regression equation upon the association between the independent and dependent variables has been controlled. The beta weight is thus 'uncontaminated' by the effects of other variables significantly associated with the dependent variable.

The zero order correlation coefficient, on the other hand, measures only the symmetrical association between an independent and a dependent variable, with nothing else considered. If there is significant relationship or interaction between several independent variables, as is often the case, the correlation

coefficient cannot discriminate between the direct effect of the independent variable under consideration and its indirect effects as mediated by other independent variables. The correlation coefficient will thus often be affected by the interrelationships between independent variables. This may lead to supression or enhancement or even complete reversal of the association between a specific independent variable and a dependent variable.

An examination of the zero order correlations between the dependent variable and each of the independent variables is thus necessary in order to determine what effect the other independent variables have on the relationship between each pair of variables. Comparison of the beta weight with the corresponding zero order correlation coefficient will disclose the effect of other independent variables on the relationship between a particular independent variable and the dependent variable, especially if a difference in sign between the two coefficients occurs.

The multiple correlation coefficient, R, and its square, the multiple coefficient of determination, will be examined in conjunction with the regression coefficients. Multiple correlation is analogous to zero order correlation, in that it represents the strength of relationship between the dependent variable and two or more independent variables acting together. It increases in value each time another significantly related

variable is introduced into the regression equation. In contrast, the beta weight for a particular variable may decrease as additional variables are brought into the equation. A high beta weight, when only one or two independent variables are in the regression equation, could be due in part to interaction between these independent variables and others not yet in the equation. The interaction and the affected beta weight would be reduced as the interacting variables were brought into the equation and their effects controlled. Thus, the existence of a high multiple correlation coefficient does not necessarily mean a high beta weight will be found.

For multiple correlation to explain as much variation in the dependent variable as possible, it is desirable that the independent variables in the regression equation be relatively unrelated to each other but at least moderately highly correlated with the dependent variable.

That is, if two or more independent variables are highly interrelated, they will be explaining essentially the same variation in the dependent variable, and will not provide as good a prediction of the dependent variable as they would if they were not highly interrelated (Blalock, 1960, p. 348). Since four of the independent variables used in this study were considered to be indicators of another factor, economic development, it is anticipated that the correlations between these

variables will be significant. Thus, the danger of inter-relation affecting the relationships between these variables and the dependent variables cannot be ignored.

A comparison of the regression model, based on the beta weights, with the zero order correlations between pairs of independent variables included in the model would disclose any interaction between independent variables which may be affecting the relationship between an independent and a dependent variable.

The stepwise regression procedure was chosen because it enables examination of the direct effect of the variable or variables which provide(s) the best prediction model for the dependent variable at any given stage of the regression process; that is, for any given number of independent variables whose inclusion provides a statistically significant contribution to the prediction of the dependent variable.

Each step of the regression procedure provides the best prediction model that can be formed with that number of independent variables selected from the pool of possible variables available for consideration. Stepwise multiple regression is a variation of multiple regression which provides a means of choosing the independent variables which will provide the best possible prediction of the dependent variable with the smallest number of independent variables. The stepwise regression procedure recursively constructs a predication equation one variable at

a time. To accomplish this, the regression program instructs the computer to choose first the single variable which is the best predictor of the dependent variable, then add to this equation the independent variable which provides the best prediction in conjunction with the first independent variable. This procedure is then continued until the number of independent variables specified by the researcher have been included in the equation or until no other independent variable makes a significant contribution to the prediction equation. At each step the optimum variable is selected, given the other variables in the equation. Consequently, the multiple correlation coefficient and its square, the multiple coefficient of determination, will increase at each step (Nie et al., 1970, p. 180).

The change in R square as each additional independent variable is introduced into the regression equation provides an estimate of the amount of variation in the dependent variable explained by that independent variable when its effect is considered in conjunction with the effects of other variables already in the equation. That is, the change in R square represents the amount of additional explained variation in the dependent variable as each successive independent variable is considered.

The inclusion of a variable in the regression equation is dependent on the statistical significance of its contribution

to the prediction of the dependent variable. Statistical significance may be determined through examination of the ratio of the regular regression coefficient, B, (unstandardized) to its standard error. A table of values of the statistic t thus formed (Student's t) could then be examined to determine the probability of a particular t value occurring by chance. The alternative rough rule of thumb that the regression coefficient be at least twice as large as its standard error may also be used to assess statistical significance at the .05 level or better (Chisholm & Whitaker, 1971, p. 112). The present study employed the latter procedure for determining significance.

When all variables that make significant contributions have been included in the regression equation, the multiple coefficient of determination -- indicating the proportion of variation in the dependent variable which can be explained by the present set of variables -- will be at its maximum. Variables not included in the regression equation at this point have effects on the dependent variable which are insignificant when the effects of variables in the equation are controlled. Inclusion of these variables would increase the multiple correlation coefficient by negligible amounts.

SUMMARY

The populations of Canada and the United States were the study population, with provinces and states considered as units

of analysis. Data were taken from Canadian and American census and vital statistics publications for 1961 and 1960, respectively.

Fertility, as measured for this study, was the number of live births per 1,000 women aged 15 to 44 in the United States, and per 1,000 women ever married aged 15 to 44 in Canada. The female labor force participation measure was the proportion of women aged 15 and over in Canada, or 14 and over in the United States, in the labor force. Degree of urbanization was the proportion of a state's population residing in Standard Metropolitan Statistical Areas, or the proportion of a province's population residing in Census Metropolitan Areas and other urban centers of 50,000 or more inhabitants. Median income was based on persons with income only, and excluded the farm population in Canada. Extent of primary industry was the proportion of the labor force employed in primary industry. Infant mortality rate was the number of infant deaths per 1,000 live births. High parity was measured as the proportion of women ever married having four or more children. Sex ratio was the number of males per 100 females.

Regression analysis was employed, using the stepwise multiple regression technique, to determine the asymmetrical effects of the independent variables on the dependent variables, fertility and female labor force participation, at each stage in the regression procedure. Correlational analysis was used to study the symmetrical relations between the independent variables.

CHAPTER III

ANALYSIS OF RESULTS

The two dependent variables, female labor force participation and fertility, were examined through regression analysis. Six factors were considered as possible independent variables influencing female labor force participation and fertility. They were: high parity (the proportion of women having born four or more children); sex ratio; degree of urbanization (the proportion of the population residing in urban areas of 50,000 or more); extent of primary industry (the proportion of the labor force in primary industry); infant mortality rate; and median income. At a later stage in the analysis, the regression equation of high parity as a dependent variable was also examined to assess the differences between the prediction models for two types of fertility measures, current and cumulative fertility.

HYPOTHESIZED RELATIONSHIPS

Relationships between each dependent and independent variable were hypothesized, as illustrated in Figures 2 and 3. Fertility was expected to be positively affected by high parity, sex ratio, extent of primary industry, and infant mortality rate, and negatively affected by degree of urbanization and median income.

Female labor force participation and fertility were also expected to be negatively related, although no causal interpretation of the relationship was ventured in the present study.

High parity, sex ratio, extent of primary industry, and infant mortality rate were expected to affect female labor force participation negatively. Degree of urbanization and median income were expected to have positive effects on female employment.

Relationships between independent variables were also hypothesized. The positive indicators of economic development, degree of urbanization and median income, were expected to be positively related. The negative indicators of economic development, extent of primary industry and infant mortality, were also expected to be positively related. Negative relationships between each of the positive indicators and each of the negative indicators of economic development were anticipated. High parity and sex ratio were expected to be positively related to each other and to the negative indicators of economic development. High parity and sex ratio were expected to be negatively associated with the positive indicators of economic development. These anticipated associations are illustrated in Figure 1. Causal direction was not implied for the relationships between independent variables.

MULTIPLE REGRESSION ANALYSIS FOR THE DEPENDENT VARIABLE FERTILITY

The relationships between fertility and seven independent variables, including female labor force participation were examined by stepwise regression. The stepwise regression program was run, incorporating variables into the regression equation in order of the strength of their direct effects on fertility. Five variables were introduced into the equation before the limits of statistical significance were reached. These were, in order of their selection: high parity, degree of urbanization, median income, infant mortality rate, and extent of primary industry. Together, these five variables explained 62.3 per cent of the variation in fertility -- that is, the multiple coefficient of determination, R^2, was 0.62343. The multiple correlation coefficients, the beta weights, and related statistics for each step in the regression procedure are shown in Table III.

The use of high parity as an independent variable in constructing a regression model for fertility may be questioned on the grounds that both fertility and parity are essentially indications of the same phenomenon. Parity represents a woman's cumulative fertility history while fertility rate indicates the current experience. It may thus be considered unrealistic to speak of parity as directly affecting fertility rate.

It is possible, however, to argue that the fertility history of an area could affect the area's current fertility

TABLE III

MULTIPLE AND ZERO ORDER CORRELATION COEFFICIENTS AND BETA

WEIGHTS FOR EACH STEP IN REGRESSION PROCEDURE: DEPENDENT VARIABLE FERTILITY

Step of Regression Procedure	Independent Variable	Multiple R	Multiple R^2	Change in R^2	Zero Order r	Zero Order r^2	Beta
1	High Parity	0.58544	0.34275	0.34275	0.58544	0.3426	0.58544
2	High Parity						0.38952
	Urbanization	0.63728	0.40613	0.06338	-0.55824	0.3115	-0.31901
3	High Parity						0.59550
	Urbanization						-0.48409
	Median Income	0.71239	0.50750	0.10138	-0.24140	0.0582	0.46133
4	High Parity						0.61546
	Urbanization						-0.46471
	Median Income						0.57565
	Infant Mortality Rate	0.76247	0.58137	0.07386	0.34106	0.1163	0.29494
5.	High Parity						0.50854
	Urbanization						-0.33208
	Median Income						0.63904
	Infant Mortality Rate						0.34616
	Primary Industry	0.78958	0.62343	0.04206	0.54190	0.2936	0.32576

rates. Since the high parity measure for all age groups includes women well past their childbearing period, variations in this measure could reflect varying attitudes toward large families which might in turn influence the childbearing practices of younger women, and thus the fertility rate. With this in mind, the high parity measure was included initially, but the regression equation for fertility with parity removed from the list of independent variables was examined as well.

There is a risk that the high parity measure might not be a legitimate predictor of fertility rate in an area, because parity might not have any deeper significance than that of being an alternative measure of fertility. This risk was sustained in the final analysis, however, because the regression equation with parity as an independent variable explained a greater proportion of the total variation in fertility ($R^2 = 0.623$) than did the equation resulting when the parity measure was held out ($R^2 = 0.554$). Thus, if there is some real value to the high parity measure as a predictor of fertility rate, some advantage in prediction will be gained by its inclusion in the regression equation.

High parity was the best single predictor of fertility, accounting by itself for 34.3 per cent of the variation in fertility ($R^2 = r^2 = 0.34275$). Similarly, the best two variable prediction model was high parity taken in conjunction with degree

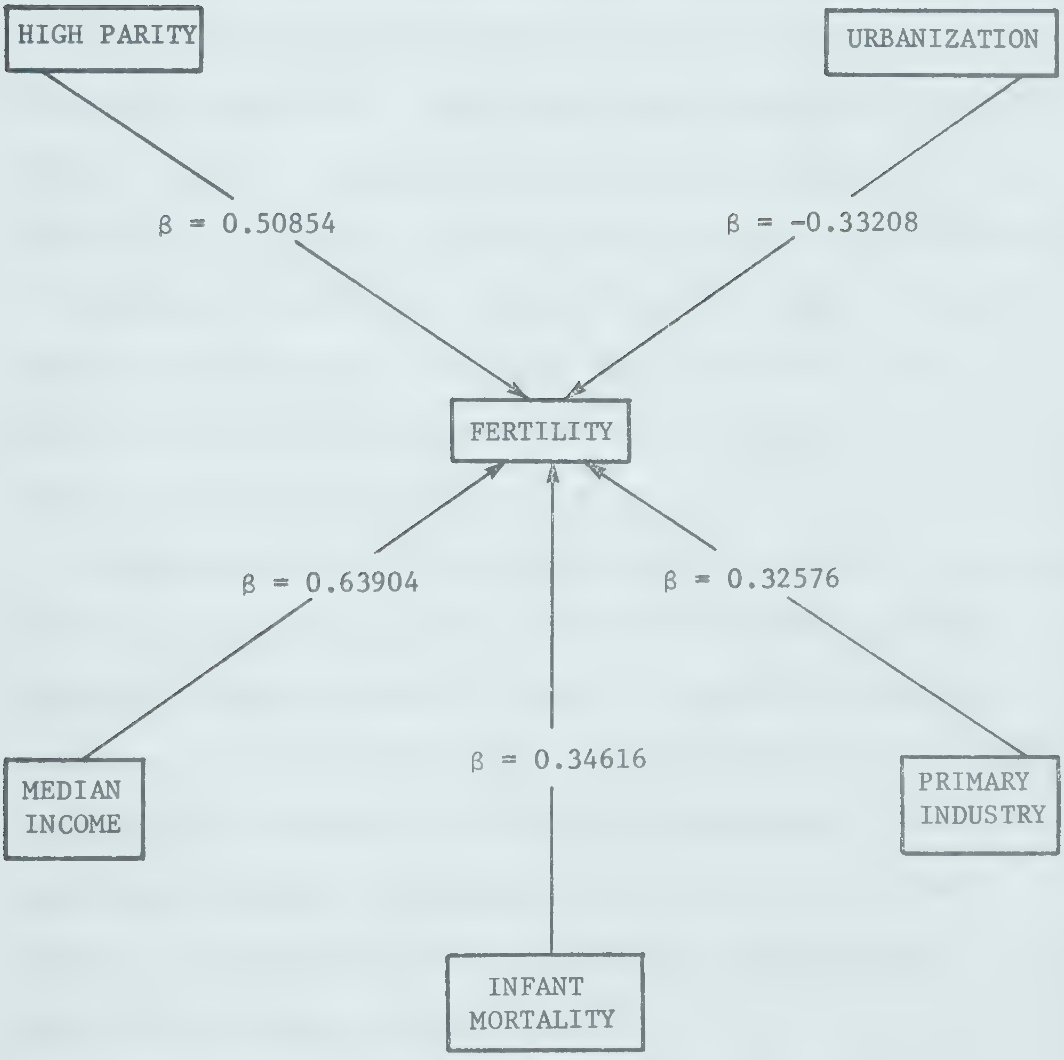
of urbanization (R^2 = 0.40613). Thus, the degree of urbanization explained an additional 6.3 percentage points of the variation in fertility after high parity had explained all it could. The best three variable prediction model included the above two variables plus median income (R^2 = 0.50750) with median income explaining an additional 10.1 percentage points of the variation in fertility. The addition of a fourth variable, infant mortality rate, to the model improved the predictive power by 7.4 percentage points (R^2 = 0.58137). The inclusion of the fifth significant variable, extent of primary industry, added the remaining 4.2 percentage points to the final prediction model. Because no other variables contributed significantly to the prediction equation, the best five variable prediction model, shown in Figure 4, became the best predictor.

Examination of Table III shows that, unlike the multiple correlation coefficient which increased as significantly related variables were added, the beta weight for any one variable fluctuated as other variables were brought into the equation. For example, the beta weight for high parity, the first variable in the equation, dropped greatly from 0.58544 to 0.38952 when degree of urbanization was brought in, then increased again to 0.59550 and to 0.61546 when median income and infant mortality rate, respectively, were introduced into the equation, and finally dropped to 0.50854 when extent of primary industry

FIGURE 4

PATH COEFFICIENTS OF VARIABLES SIGNIFICANTLY*

ASSOCIATED WITH FERTILITY



$*p \leq .05$

entered the equation. Similar variations in beta weights occurred for the other variables entering the equation prior to the final step. None was quite so erratic, however, as the variations in the beta weight of high parity, which was affected by the uncontrolled influences of four remaining independent variables, until each in turn entered the regression equation.

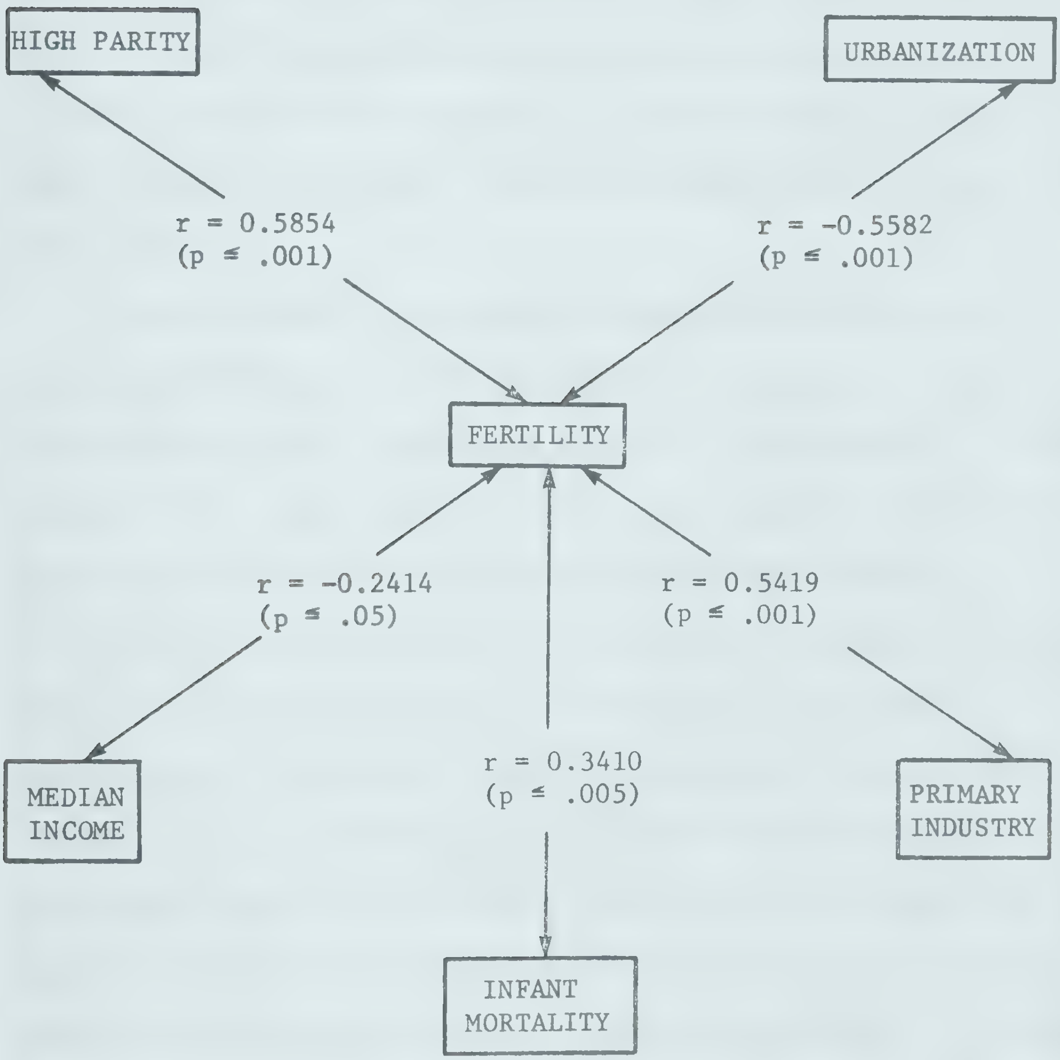
With reference to the hypothesized relationships, four of the selected variables were related to fertility in the anticipated directions. High parity, infant mortality rate, and extent of primary industry had positive direct effects on fertility ($\beta = 0.50854$, $\beta = 0.34616$, and $\beta = 0.32576$, respectively), as hypothesized. Degree of urbanization had a negative direct effect on fertility ($\beta = -0.33208$), also as expected. The positive direct effect of median income on fertility ($\beta = 0.63904$), however, was contrary to expectation.

A comparison of the beta weights with the zero order correlation coefficients between fertility and the five variables in the regression equation, shown in Figure 5, disclosed coefficients of like sign for all variables except median income, where a significant negative correlation was found, as hypothesized. Thus, the hypothesized negative association between median income and fertility was supported by the correlation coefficient but negated by the sign of the beta weight.

In an attempt to reconcile the positive direct effect of median income on fertility, with the negative correlation between

FIGURE 5

ZERO ORDER CORRELATIONS BETWEEN FERTILITY AND FIVE INDEPENDENT VARIABLES

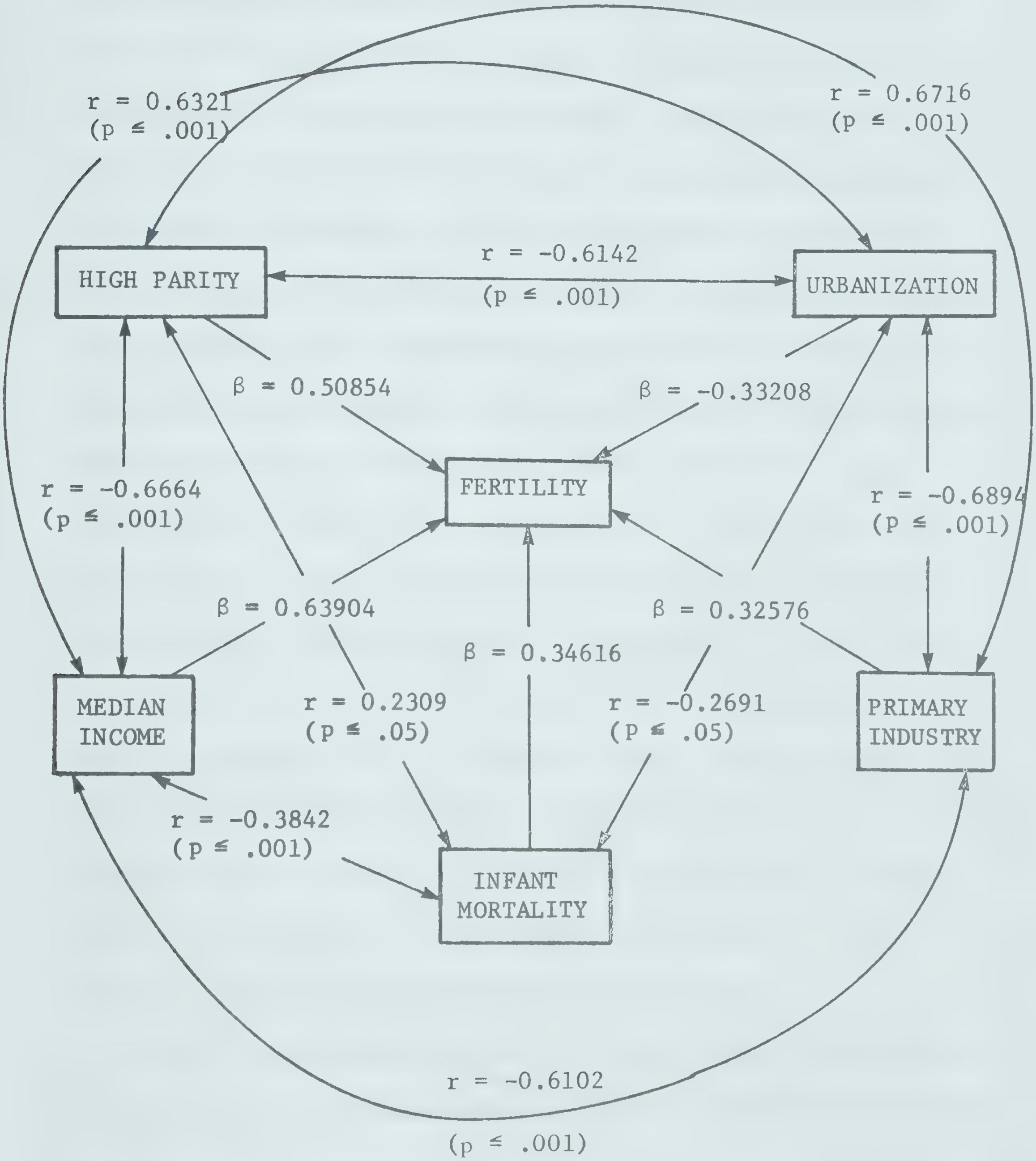


these variables, the zero order correlations between variables in the regression equation were examined in conjunction with their beta weights. A positive correlation between two variables should be reflected by similarity in sign of their association with a third variable. Conversely, negative correlation between two variables should be accompanied by dissimilarity in sign of their association with a third variable. This pattern of association was supported by the associations between fertility and all pairs of variables in the regression equation except those pairs involving median income, as may be seen in Figure 6.

Thus, the negative correlation between high parity and degree of urbanization ($r = -0.6142$) was accompanied by direct effects on fertility of opposite sign ($\beta = 0.50854$ and $\beta = -0.33208$, respectively). High parity was positively related to both infant mortality rate ($r = 0.2309$) and extent of primary industry ($r = 0.6716$), and both of these variables had the expected positive direct effects on fertility ($\beta = 0.34616$ and $\beta = 0.32576$, respectively). Similarly, degree of urbanization was negatively related to both infant mortality rate ($r = -0.2691$) and extent of primary industry ($r = -0.6894$). The negative beta weight of degree of urbanization ($\beta = -0.33208$) was, therefore, in accord with the positive beta weights of these two variables ($\beta = 0.34616$ and $\beta = 0.32576$, respectively). Infant mortality rate and extent

FIGURE 6

CORRELATIONS BETWEEN INDEPENDENT VARIABLES AFFECTING FERTILITY, AND BETA WEIGHTS* OF THEIR EFFECTS



*p ≤ .05

of primary industry were not significantly related, although the slight positive correlation ($r = 0.1029$, $p = .217$) between them was in keeping with their positive direct effects on fertility.

When relationships between median income and the other variables in the regression equation -- high parity, degree of urbanization, infant mortality rate and extent of primary industry -- were examined, however, this pattern was not found. The correlations between the other independent variables and median income, considered in conjunction with the beta weights of these variables, each suggested a negative direct effect between median income and fertility. The negative correlations between median income and three of the remaining variables -- high parity ($r = -0.6664$), infant mortality rate ($r = -0.3842$) and extent of primary industry ($r = -0.6102$) -- coupled with the positive direct effects of these variables on fertility ($\beta = 0.50854$, $\beta = 0.34616$ and $\beta = 0.32576$, respectively) all suggested that median income should have a negative direct effect on fertility, which it did not ($\beta = 0.63904$). Similarly, degree of urbanization was positively related to median income ($r = 0.6321$) and had a negative beta weight ($\beta = -0.33208$), again suggesting that median income should negatively affect fertility.

Since the zero order correlation between median income and fertility was negative, as anticipated, one or more of the other

variables in the regression equation must have interacted with median income. The effect of this interaction was to change the sign of the relationship between median income and fertility. Thus, when the effects of these interacting variables were controlled by the regression procedure, the relationship between median income and fertility changed, and median income was revealed to have a significant positive effect on fertility.

In an attempt to discover the nature of the interaction and to identify the variables involved in it, another method of analysis was brought in. Partial correlations of median income and fertility, controlling individually for each of the remaining variables in the regression equation, were examined.

TABLE IV

PARTIAL CORRELATION COEFFICIENTS, DEPENDENT VARIABLE FERTILITY, INDEPENDENT VARIABLE MEDIAN INCOME

Control Variable	Partial Correlation
High Parity	0.2459*
Urbanization	0.1733
Infant Mortality Rate	-0.1272
Primary Industry	0.1341

*Statistically Significant, $p \leq .05$.

Three of the control variables, high parity, degree of urbanization and extent of primary industry, when individually applied to the association between median income and fertility, changed the sign of the zero order correlation from negative to positive. The partial correlation between fertility and median income, controlling for extent of high parity, was statistically significant (r. = 0.2459), and that controlling for degree of urbanization was almost as strong (r. = 0.1733, p = .095).

Since controlling for each of these variables individually changed to positive the sign of the zero-order correlation between fertility and median income, it is understandable that controlling for the effects of two or more of these variables simultaneously would have created an even stronger positive relationship between fertility and median income. This was exactly what happened. Both the high parity measure and degree of urbanization entered the regression equation ahead of median income. Thus, their effects were being controlled for, much as they were in the partial correlations but simultaneously, when the direct effect of median income upon fertility was established. Controlling for infant mortality rate by partial correlation did not change the sign of the correlation between fertility and median income, but it did significantly reduce the negative correlation between the two variables, from

r = -0.2414 to r. = -0.1272. Thus, infant mortality rate also had an effect on the relationship between fertility and median income, although this effect was not as strong as the effects of the other three variables in the regression equation. It has already been mentioned that controlling for extent of primary industry by partial correlation also reversed the sign of the relationship between fertility and median income. Both infant mortality rate and extent of primary industry entered the regression equation after median income, so controlling for their effects played no part in establishing the positive direct effect between median income and fertility. However, controlling for the effects of these variables could still have influenced the strength of this positive relationship. An examination of the beta weights of median income, for each step in the regression equation confirms this supposition. Table III shows that the beta coefficient for median income was 0.46133 when this variable was first brought into the regression equation. When the fourth variable, infant mortality rate, entered the equation, the beta weight for median income increased to 0.57565. When extent of primary industry was brought in, at the fifth and final significant step in the regression procedure, the beta coefficient for median income rose to 0.63904. Thus, it seems safe to attribute the change in sign between the correlation coefficient and the beta weight for median income to the effects of interaction between

the other variables in the regression equation, and primarily to the high parity measure and degree of urbanization, because these variables entered the regression procedure before median income.

The hypothesized relationships between fertility and the remaining independent variables were unconfirmed by regression analysis. Sex ratio and female labor force participation were not significantly associated with fertility when the effects of the other five independent variables were controlled by the regression procedure. Had their inclusion fallen within the limits of statistical significance, sex ratio would have entered the equation sixth ($\beta = 0.02957$) and female labor force participation last ($\beta = -0.00025$). The zero order correlations between fertility and these variables disguised their lack of importance as predictors and showed association of anticipated signs: fertility and sex ratio, $r = 0.4597$, $P \leq .001$; fertility and female labor force participation, $r = -0.2753$, $P \leq .05$. Controlling for the effects of the other variables in the regression equation reduced the covariation of fertility with sex ratio and female labor force participation, so that their direct effects on fertility were below statistical significance. Thus, in association with the variables already in the equation, sex ratio and female labor force participation did not add to the predictive power of the model: if one knows the values of

these first five variables for an area, knowledge of the other two will not substantially assist in predicting the fertility rate in that area. It must be remembered, in evaluating the above statements, that this study deals only with ecological measures on the state- and province-wide level. Variables that have direct causal connections at the individual level may be unrelated when correlations of aggregate measures are used, and vice versa.

MULTIPLE REGRESSION ANALYSIS FOR THE DEPENDENT VARIABLE FEMALE LABOR FORCE PARTICIPATION

The relationships between female labor force participation and seven independent variables, including fertility, were examined by multiple regression. The stepwise regression program was executed, bringing variables into the regression equation in order of the strength of their direct effect on female labor force participation. Four variables were introduced into the equation before the limits of statistical significance were reached. These were, in order of their selection, extent of primary industry, high parity, infant mortality rate and median income. Together, these four variables explained 52.1 per cent of the variation in female labor force participation (that is, the multiple coefficient of determination, R^2, was 0.52100). The multiple correlation coefficients, the beta weights, and related

statistics for each step in the regression procedure are shown in Table V.

The best single predictor of female labor force participation was extent of primary industry, which by itself accounted for 36.2 per cent of the variation in the dependent variable ($R^2 = r^2 = 0.36214$). Similarly, the best two variable prediction model was extent of primary industry in conjunction with high parity ($R^2 = 0.43262$). Thus, the high parity measure explained an additional 7.0 percentage points of the variation in female labor force participation after primary industry had explained all it could. The best three variable prediction model included these two variables and infant mortality rate ($R^2 = 0.48516$), with infant mortality rate explaining an additional 5.3 percentage points of the variation in female labor force participation. The addition of the fourth significant variable, median income, to the equation increased prediction by 3.6 percentage points. Since no further variables contributed significantly to the prediction equation, the best four variable prediction model, shown in Figure 7, was the best predictor.

Examination of Table V shows that unlike the multiple correlation coefficient, which increased as each significantly related variable was added, the beta weight for a particular variable frequently decreased as other variables were brought into the equation. The beta weight of extent of primary industry,

TABLE V

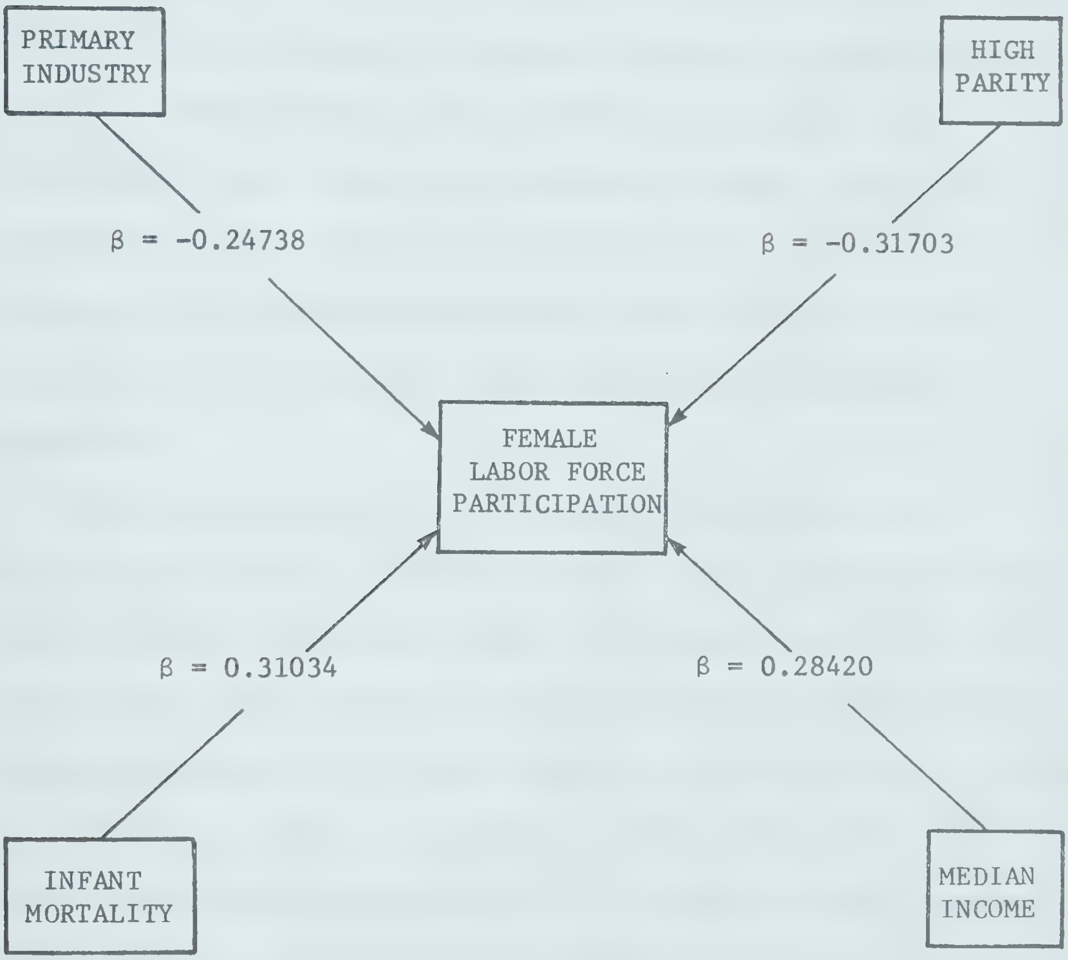
MULTIPLE AND ZERO ORDER CORRELATION COEFFICIENTS AND BETA WEIGHTS FOR

EACH STEP IN REGRESSION PROCEDURE: DEPENDENT VARIABLE FEMALE LABOR FORCE PARTICIPATION

Step of Regression Procedure	Independent Variable	Multiple R	Multiple R^2	Change in R^2	Zero Order r	Zero Order r^2	Beta
1	Primary Industry	0.60178	0.36214	0.36214	-0.60178	0.3621	-0.60178
2	Primary Industry						-0.36115
	High Parity	0.65774	0.43262	0.07048	-0.60085	0.3609	-0.35831
3	Primary Industry						-0.33868
	High Parity						-0.42794
	Infant Mortality Rate	0.69653	0.48516	0.05254	0.10254	0.0105	0.23620
4	Primary Industry						-0.24738
	High Parity						-0.31703
	Infant Mortality Rate						0.31034
	Median Income	0.72180	0.52100	0.03584	0.52719	0.2779	0.28420

FIGURE 7

PATH COEFFICIENTS OF VARIABLES SIGNIFICANTLY* ASSOCIATED WITH FEMALE LABOR FORCE PARTICIPATION



*p ≤ .05

for instance, dropped from -0.60178 in the first step of the regression procedure to -0.36115 when parity was introduced into the equation, then to -0.33868 when infant mortality rate was brought into the equation, and to -0.24738 when the final significant variable, median income, was included. The introduction of additional variables did not greatly or consistently reduce the beta weights of high parity or infant mortality rate. These variables entered the regression equation at later steps, when the effects of one or two variables had already been controlled. Thus, their direct effects on female labor force participation were never as contaminated by the uncontrolled effects of other variables as was the direct effect of extent of primary industry in the initial stages of the regression procedure.

With reference to the hypothesized relationships, three of the variables were related to female labor force participation in the expected directions. Extent of primary industry and the high parity measure had negative direct effects on female labor force participation, as hypothesized ($\beta = -0.24738$ and $\beta = -0.31703$, respectively). Median income had a positive direct effect on female labor force participation ($\beta = 0.28420$), also as expected, but the positive direct effect of infant mortality rate on female labor force participation ($\beta = 0.31034$) was contrary to expectations.

A comparison of the beta weights with the zero order correlation coefficients between female labor force participation and the four variables in the regression equation, as shown in Figure 8, disclosed coefficients of like sign for each pair of variables, although the correlation between infant mortality rate and female labor force participation was too slight for statistical significance. Thus, the hypothesized negative association between infant mortality rate and female labor force participation was not supported, even when the less refined correlational measure of association was employed.

In an attempt to explain the positive association between infant mortality rate and female labor force participation, the zero order correlations between variables in the regression equation were examined in conjunction with their beta weights. As mentioned previously, a positive correlation between two variables should be reflected by similarity in sign of their association with a third variable. Conversely, a negative correlation between two variables should be accompanied by dissimilarity in sign of their associations with a third variable. Thus, the positive correlation between extent of primary industry and high parity ($r = 0.6716$) should have been, and was, reflected by direct effects on female labor force participation of like sign, in this case, negative ($\beta = -0.24738$ and $\beta = -0.31703$, respectively). Similarly, as illustrated by

FIGURE 8

ZERO ORDER CORRELATIONS BETWEEN FEMALE LABOR FORCE PARTICIPATION AND FOUR INDEPENDENT VARIABLES

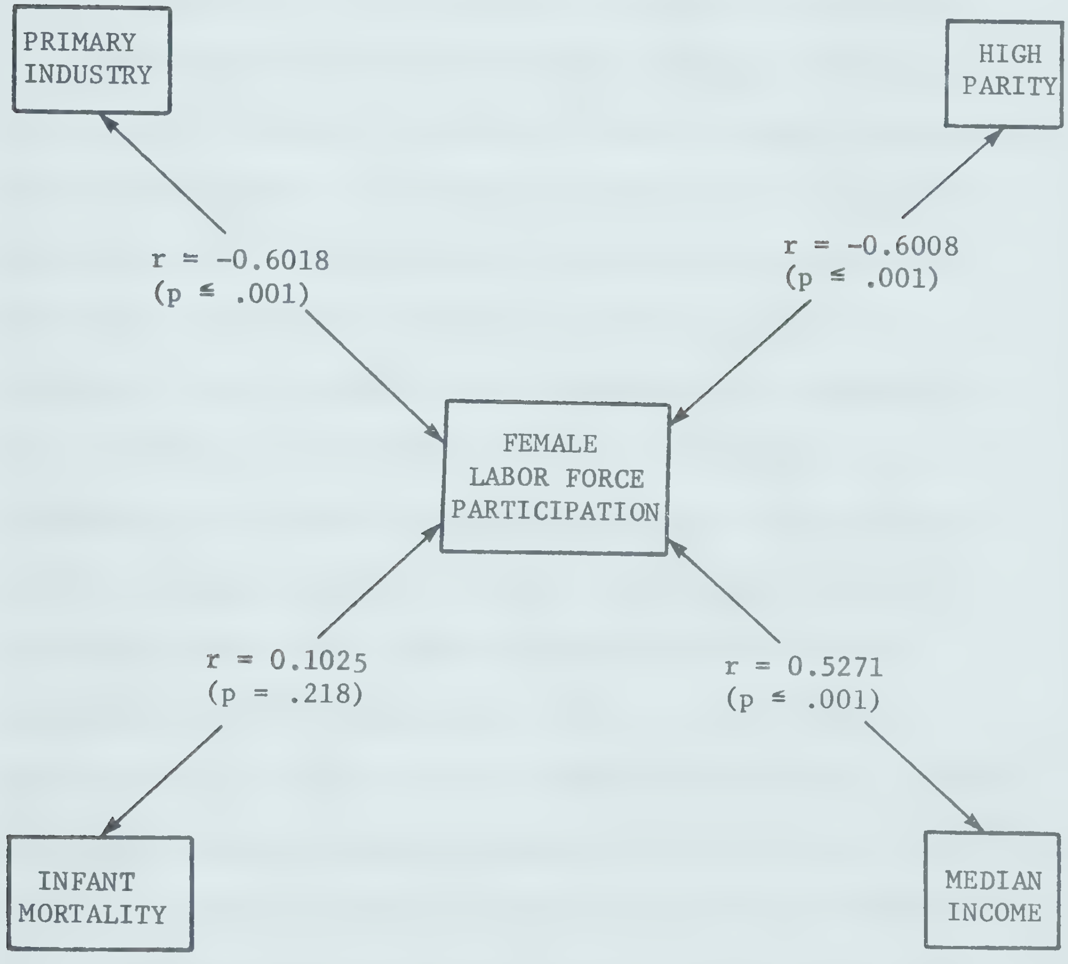
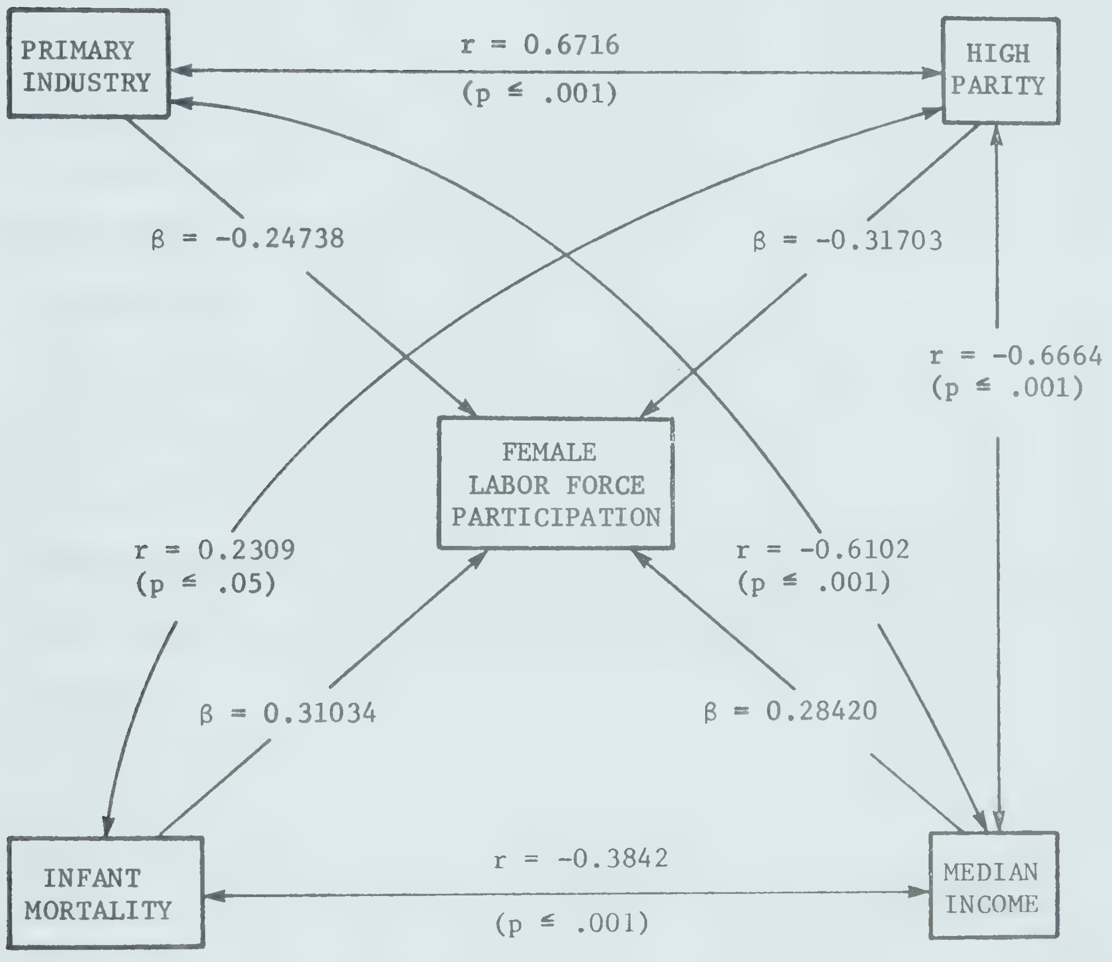


Figure 9, extent of primary industry and median income were negatively related (r = -0.6102) and had direct effects on female labor force participation of opposite sign (β = -0.24738 and β = 0.28420, respectively). The high parity measure and median income were also negatively related (r = -0.6664) and had the anticipated opposite effects on female labor force participation (β = -0.31703 and β = 0.28420, respectively).

When associations between infant mortality rate and the other three variables -- extent of primary industry, high parity and median income -- were examined, however, this pattern was not continued. Infant mortality rate and high parity were positively related (r = 0.2309) and should have had direct effects of like sign on female labor force participation, but they did not (β = 0.31034 and β = -0.31703, respectively). Similarly, the negative association between infant mortality rate and median income (r = -0.3842) suggested that these variables should affect female labor force participation oppositely, but both had positive direct effects on this variable (β = 0.31034 and β = 0.28420, respectively). Extent of primary industry and infant mortality rate were not significantly related, although a slight positive correlation (r = 0.1029, p = .217) existed between them. Infant mortality rate and extent of primary industry had opposite direct effects on female labor force participation (β = 0.31034 and β = -0.24738).

FIGURE 9

CORRELATIONS BETWEEN INDEPENDENT VARIABLES AFFECTING FEMALE LABOR FORCE PARTICIPATION, AND BETA WEIGHTS* OF THEIR EFFECTS



*p ≤ .05

Thus, the correlations between infant mortality rate and each of the other variables in the regression equation, when considered in conjunction with the sign of their beta weights, all suggested a negative association between infant mortality rate and female employment, as had been hypothesized.

The zero order correlation between infant mortality rate and female labor force participation was statistically insignificant ($r = 0.1025$, $p = .218$), but the direct effect of infant mortality rate on the dependent variable was significant. One or more of the other variables in the regression equation must, therefore, have interacted with infant mortality. When the effects of these variables were controlled by the regression procedure, the relationship between infant mortality rate and female labor force participation was significantly increased. In an attempt to discover which variables were involved in this interaction, partial correlation coefficients were examined using each of the other three variables in the regression equation as control variables.

TABLE VI

PARTIAL CORRELATION COEFFICIENTS, DEPENDENT VARIABLE FEMALE LABOR FORCE PARTICIPATION, INDEPENDENT VARIABLE INFANT MORTALITY RATE

Control Variable	Partial Correlation
Primary Industry	0.2070
High Parity	0.3102*
Median Income	0.3887*

*Statistically significant, $p \leq .01$.

All three control variables -- extent of primary industry, high parity and median income -- when individually applied to the association between infant mortality rate and female labor force participation, increased the strength of this association. Two of these partial correlations were strong enough for statistical significance. The partial correlations between female labor force participation and infant mortality rate, controlling for high parity (r. = 0.3102) and for median income (r. = 0.3887) were significant at the .01 and .001 levels, respectively, and that controlling for extent of primary industry was almost as strong (r. = 0.2070, p = .058). Controlling for the effects of each of these three variables, individually, strengthened the relationship between infant mortality rate and female employment.

Therefore, controlling for the effects of two or more variables simultaneously should create an even stronger relationship between infant mortality and the dependent variable. Two of these control variables, extent of primary industry and high parity, entered the regression equation before infant mortality rate. Thus, their influences were controlled simultaneously when the effect of infant mortality rate on female labor force participation was first assessed, in the third step of the regression procedure. Although median income entered the regression equation after infant mortality rate, and thus controlling for its effect could not have influenced the establishment of the positive relationship between infant mortality rate and female labor force participation, it was able to affect the strength of this association. An examination of the beta weight of infant mortality rate, both before and after median income entered the equation, reveals that controlling for the effect of median income did add to the explanatory power of infant mortality rate. Table V shows that the beta weight for infant mortality rate increased from 0.23620 to 0.31034 when median income was brought into the regression equation. Thus, the unexpected positive relationship between infant mortality rate and female labor force participation appeared only when the effects of the other independent variables were controlled through the multiple regression procedure.

The hypotheses concerning relationships between female labor force participation and the remaining three independent variables were unconfirmed by regression analysis. Sex ratio, degree of urbanization and fertility rate were not significantly associated with female labor force participation when the effects of the other four independent variables were controlled by the regression procedure. Had their inclusion fallen within the limits of statistical significance, sex ratio would have entered the equation fifth ($\beta = 0.13165$), degree of urbanization, sixth ($\beta = -0.01017$), and fertility last. The zero order correlations for two of these variables, degree of urbanization and fertility, showed significant symmetrical associations, of anticipated sign, between these variables and female labor force participation ($r = 0.4448$ and $r = -0.2753$, respectively). The correlation between sex ratio and female labor force participation was not significant. Controlling for the influences of the four variables in the regression equation reduced the covariation of female labor force participation with fertility and degree of urbanization, so that their direct effects on female employment were not statistically significant. Thus, in the light of better predictors -- extent of primary industry, high parity, infant mortality rate and median income -- the effects of fertility, degree of urbanization and sex ratio are negligible: if one knows the values of the first four variables

for an area, knowledge of the remaining three will not substantially assist in predicting the rate of female labor force participation in that area.

MULTIPLE REGRESSION ANALYSIS FOR HIGH PARITY AS THE DEPENDENT VARIABLE

The high parity measure was treated initially only as an independent variable representing both cumulative fertility and an assessment of the extent to which traditional attitudes and norms concerning family size were apparent in an area. When it was discovered that neither fertility nor female labor force participation had a significant direct effect on the other, but that high parity was an important predictor of both fertility and female employment in an area, it was decided to examine the regression equation for high parity as a dependent variable. Thus, because high parity is a valid alternative measure of fertility, regardless of any attitudinal standing it may represent, identification of the variables which are good predictors of high parity should disclose the similarities and differences of association between each of the other variables considered in this study and the two types of fertility measurement.

If fertility is the best predictor of high parity, just as high parity was the best predictor of fertility, then it may be argued that the high parity measure has no broader significance

than that of being an alternative measure of fertility, and should, therefore, not be included as a predictor in the regression analysis of current fertility. On the other hand, the direct effect of high parity on female labor force participation -- either as an alternate measure of fertility or as a measure of both cumulative fertility and prevalent attitudes in an area -- may not reliably establish the direction of causation between levels of cumulative fertility and female employment. If female labor force participation is as good a predictor of high parity as high parity was of female labor force participation, then the direction of the causal linkage between these variables may not be suggested.

For these reasons, the regression analysis of high parity, using seven independent variables including fertility and female labor force participation, was examined. The stepwise regression program was run, bringing variables into the regression equation in order of the strength of their direct effect on high parity. Five variables were introduced into the equation before the limits of statistical significance were reached. These were, in order of their selection, extent of primary industry, sex ratio, median income, female labor force participation and fertility. Together, these five variables explained 76.7 per cent of the variation in high parity (that is, the multiple coefficient of determination, R^2, was 0.76676). The multiple

correlation coefficients, the beta weights, and related statistics for each step in the regression procedure are shown in Table VII.

The best single predictor of high parity was extent of primary industry, which by itself accounted for 45.1 per cent of the variation in the dependent variable ($R^2 = r^2 = 0.45103$). Similarly, the best two variable prediction model was extent of primary industry in conjunction with sex ratio ($R^2 = 0.58028$). Thus, the masculinity ratio explained an additional 12.9 percentage points of the variation in high parity after primary industry had explained all it could. The best three variable prediction model included these two variables and median income ($R^2 = 0.70305$), with median income explaining an additional 12.3 percentage points of the variation in high parity. The addition of the fourth variable, female labor force participation, to the model improved the predictive power by 3.1 percentage points ($R^2 = 0.73378$). The inclusion of the final significant variable, fertility, added the remaining 3.3 percentage points to the final prediction model, shown in Figure 10.

The tremendous drop in the beta weight of extent of primary industry, from 0.67159 in the first step of the regression procedure to 0.06791 in the final step, as illustrated in Table VII, suggested that much of the effect of primary industry on high parity was actually due to the effects of other variables on high parity. When the effects of these variables on high parity

TABLE VII

MULTIPLE AND ZERO ORDER CORRELATION COEFFICIENTS AND BETA WEIGHTS

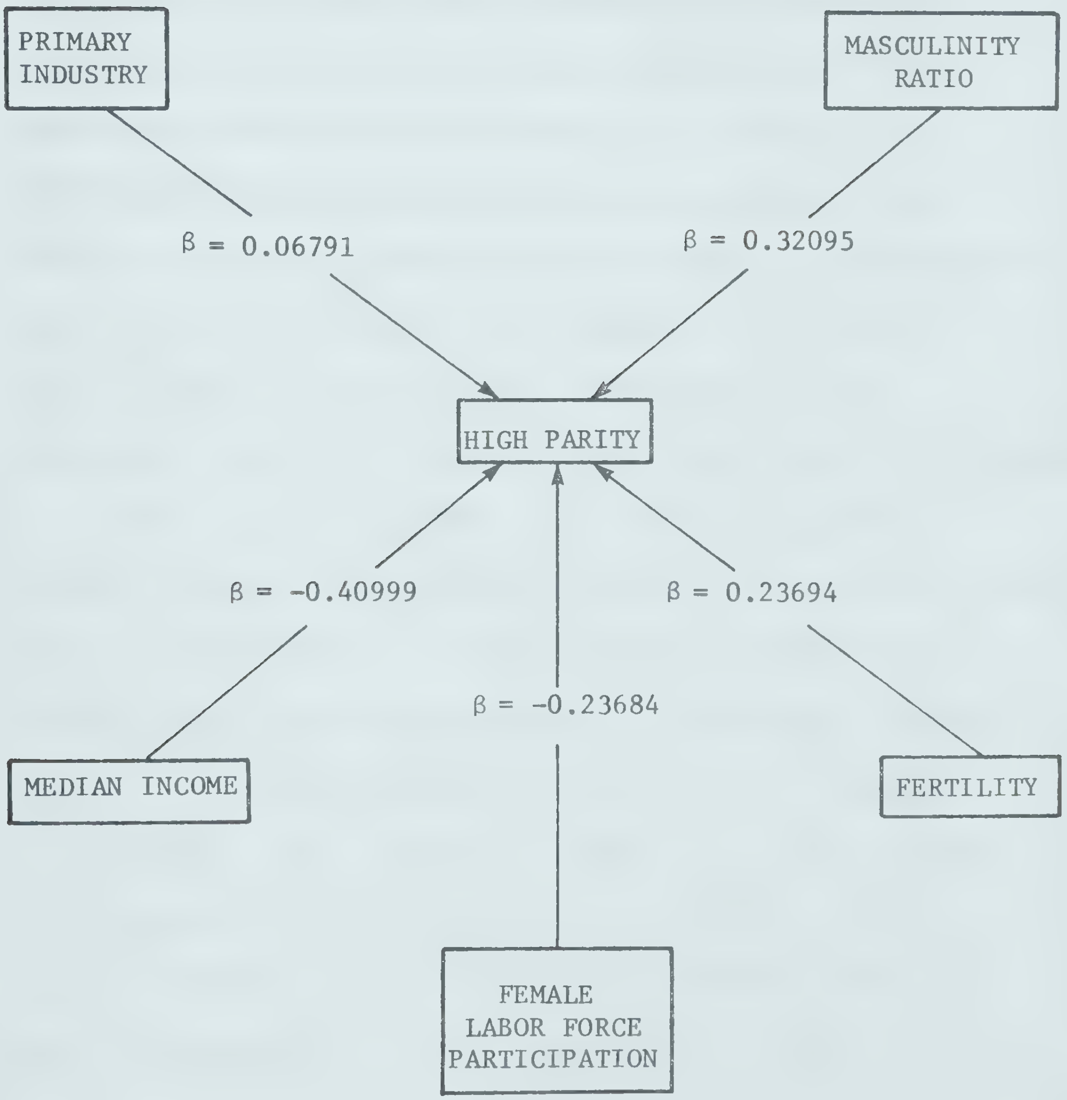
FOR EACH STEP IN REGRESSION PROCEDURE: DEPENDENT VARIABLE HIGH PARITY

Step of Regression Procedure	Independent Variable	Multiple R	Multiple R^2	Change in R^2	Zero Order r	Zero Order r^2	Beta
1	Primary Industry	0.67159	0.45103	0.45103	0.67159	0.4510	0.67159
2	Primary Industry						0.57587
	Sex Ratio	0.76176	0.58028	0.12925	0.52020	0.2706	0.37203
3	Primary Industry						0.29860
	Sex Ratio						0.39809
	Median Income	0.83848	0.70305	0.12277	-0.66627	0.4439	-0.44341
4	Primary Industry						0.19656
	Sex Ratio						0.40062
	Median Income						-0.38579
	Female Labor Force Participation	0.85661	0.73378	0.03073	-0.60085	0.3610	-0.22690
5	Primary Industry						0.06791
	Sex Ratio						0.32095
	Median Income						-0.40999
	Female Labor Force Participation						-0.23684
	Fertility	0.87565	0.76676	0.03297	0.58544	0.3427	0.23694

FIGURE 10

PATH COEFFICIENTS OF VARIABLES SIGNIFICANTLY*

ASSOCIATED WITH HIGH PARITY



*p ≤ .05

were controlled by including the variables in the regression equation, the remaining effect of extent of primary industry on high parity was quite small. Changes in the value of the beta weight for a particular independent variable as other variables enter the regression equation are quite common and have been discussed in earlier sections of this chapter.

Since no hypotheses regarding the direct effects of other variables on high parity were formulated, the signs of the direct effects could only be compared with the signs of the anticipated symmetrical relationships. All five of the variables in the regression equation were related to high parity as expected. Extent of primary industry, the masculinity ratio, and current fertility were expected to be positively related to high parity, and the direct effects of these variables on high parity supported these expectations ($\beta = 0.06791$, $\beta = 0.32095$, and $\beta = 0.23694$, respectively). Negative correlations were anticipated between high parity and both median income and female labor force participation. Both of these variables had negative direct effects on high parity: median income, $\beta = -0.40999$, and female labor force participation, $\beta = -0.23684$. Thus, the direct effects of all five variables in the regression of high parity were as would be expected.

The remaining two variables, infant mortality rate and degree of urbanization did not have significant direct effects

on high parity when the effects of the other five variables were controlled by the regression procedure. Had their inclusion fallen within the limits of statistical significance, infant mortality rate would have entered the equation sixth ($\beta = -0.07193$) and degree of urbanization last ($\beta = 0.08737$). In the light of better predictors -- extent of primary industry, sex ratio, median income, female labor force participation and fertility -- the effects of infant mortality rate and degree of urbanization on high parity were negligible.

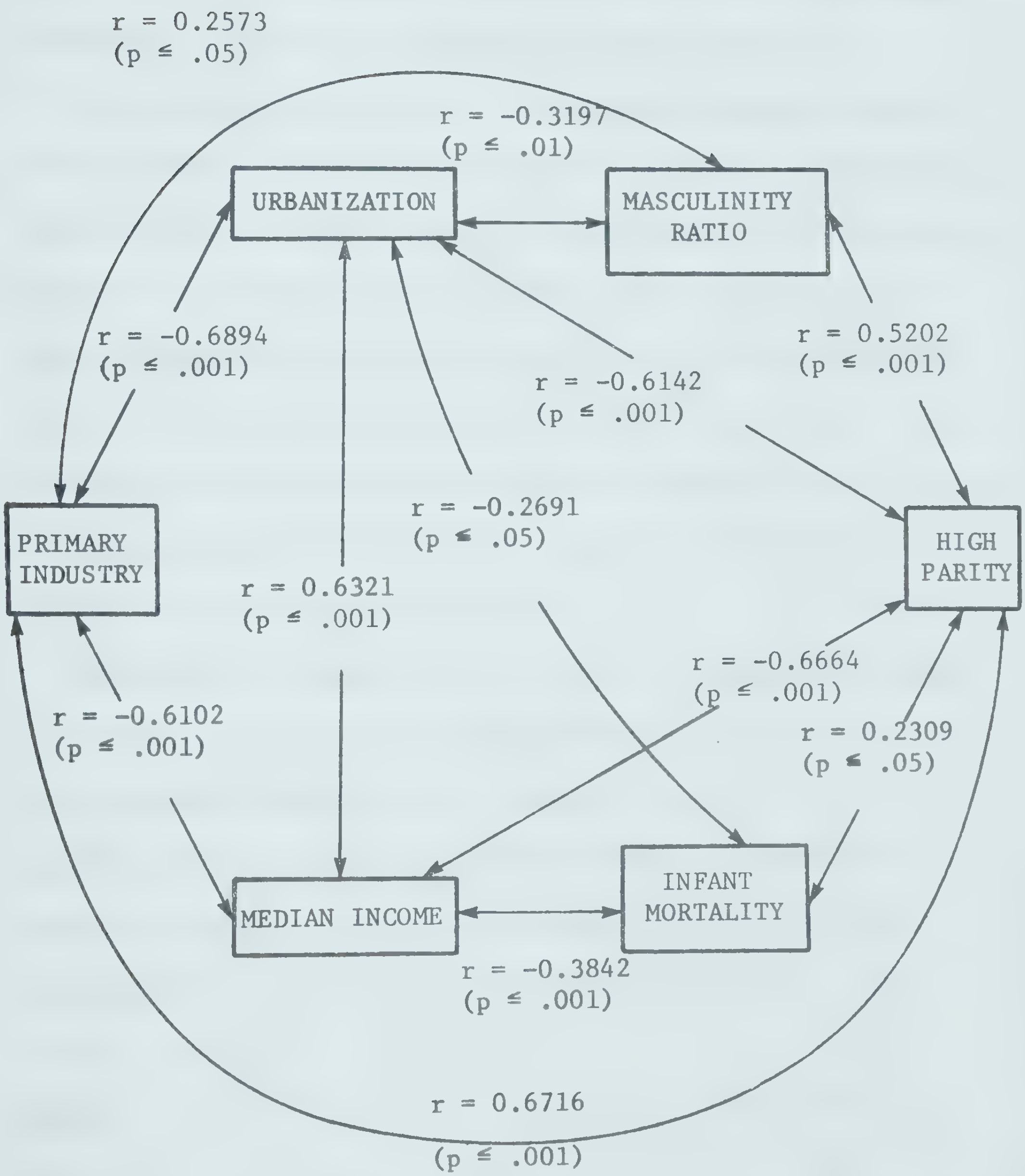
CORRELATIONAL ANALYSIS OF THE INDEPENDENT VARIABLES

The correlations discovered between most pairs of the independent variables have been discussed in the preceding sections of this chapter. However, all such correlations will be mentioned briefly here. Correlations between all pairs of variables were anticipated, but three of these were unconfirmed by the data. All correlations that were significant, were of hypothesized sign, as may be seen by comparing Figure 1, showing the anticipated correlations, with Figure 11, showing the significant correlations for the study population.

Degree of urbanization and median income, the positive indicators of economic development were positively correlated ($r = 0.6321$). Degree of urbanization was negatively related to each of the remaining independent variables: extent of

FIGURE 11

CORRELATIONS BETWEEN INDEPENDENT VARIABLES*



*Correlations not shown were not significant

primary industry (r = -0.6894), infant mortality rate (r = -0.2691), high parity (r = -0.6142), and the masculinity ratio (r = -0.3197). Median income was negatively related to extent of primary industry (r = -0.6102), infant mortality rate (r = -0.3842), and high parity (r = -0.6664), but the relationship between median income and masculinity ratio was not statistically significant.

The negative indicators of economic development, extent of primary industry and infant mortality rate, were not significantly related to each other, although both were negatively correlated with the two positive indicators of economic development. Extent of primary industry was positively related to both high parity (r = 0.6716) and masculinity ratio (r = 0.2573). Infant mortality rate was positively related to high parity (r = 0.2309), but the correlation between infant mortality rate and sex ratio was not statistically significant.

High parity and masculinity ratio were positively related (r = 0.5202), as expected. High parity was positively related to the negative indicators of economic development and negatively related to the positive indicators. Masculinity ratio was positively related to extent of primary industry and negatively related to degree of urbanization.

SUMMARY

When multiple regression analysis had selected all variables

whose inclusion contributed significantly to the prediction of fertility, a five variable prediction model was formed. The variables included in this model, in order of their entry into the regression equation, were: high parity, degree of urbanization, median income, infant mortality rate, and extent of primary industry. High parity, median income, infant mortality rate, and extent of primary industry had positive direct effects on fertility. Degree of urbanization had a negative direct effect on fertility. The signs of the direct effects (beta weights) of each of these variables on fertility were as anticipated, except for that of median income. Median income was anticipated to have a negative effect on fertility, however, a positive direct effect and a negative symmetrical correlation were found. These discrepancies were examined through partial correlational analysis, which suggested that the change in sign was due to controlling for the effects of the other variables through the regression procedure.

No significant direct effect between current fertility and female labor force participation was discovered when the effects of the independent variables were considered. A negative symmetrical relationship did exist, however, between these variables. The regression analysis of female labor force participation resulted in the formation of a four-variable prediction model. The variables included in the regression

equation, in order of their selection, were: extent of primary industry, high parity, infant mortality rate, and median income. Extent of primary industry and high parity had negative direct effects on female labor force participation. Infant mortality rate and median income had positive direct effects on female labor force participation. The signs of the direct effects of these variables on female labor force participation were as hypothesized, except for that of infant mortality rate. A negative relationship was hypothesized between infant mortality rate and female labor force participation, but a positive association was discovered. The zero order correlation between these variables was non-significant. Partial correlational analysis suggested that the significant positive effect of infant mortality rate on female labor force participation was revealed by controlling for the effects of the other variables in the regression equation.

Because high parity was included in the regression equation of both fertility and female labor force participation, and because high parity was essentially another type of fertility measure, it was decided to examine the regression analysis of high parity as a dependent variable. The regression analysis of high parity suggested a five-variable prediction model. The variables included in the regression equation, in order of their entry into the equation, were: extent of primary industry,

sex ratio, median income, female labor force participation and fertility. Extent of primary industry, masculinity ratio and fertility had positive direct effects on high parity. Median income and female labor force participation had negative direct effects on high parity. Hypotheses concerning the direct effects of other variables on high parity had not been stated. The signs of the beta weights of the five variables in the regression equation of high parity were, however, of like sign to the postulated, and discovered, correlation coefficients between these variables.

Correlations between the six independent variables -- degree of urbanization, median income, extent of primary industry, infant mortality rate, high parity and sex ratio -- were mainly as hypothesized. All significant correlations were of anticipated sign. Three of the hypothesized relationships were unsupported by the data. Infant mortality rate was not significantly related to extent of primary industry or sex ratio. Sex ratio was also unrelated to median income.

CHAPTER IV

CONCLUSIONS AND SUGGESTIONS FOR FURTHER STUDY

The data analysis has shown that the majority of the relationships between variables were as hypothesized in Chapter I. All but one of the twelve research propositions received at least partial support from the data.

CORRELATION BETWEEN INDEPENDENT VARIABLES

The significant zero order correlations between pairs of independent variables were all of hypothesized sign. Only three of the possible pairs of independent variables were not significantly correlated. The five research propositions concerning the symmetric relations between the six independent variables were thus fairly well supported by the data.

Degree of urbanization and median income, the positive indicators of economic development, were positively correlated with each other, as was anticipated by the first research proposition. These indicators were each negatively correlated with the negative indicators of economic development, extent of primary industry and infant mortality rate. Thus, the anticipated negative relationships between positive and negative indicators of economic development, described in Proposition 3, were confirmed

for the present data. Extent of primary industry and infant mortality rate were not significantly related to each other, however, so Proposition 2 was not supported by the data.

Proposition 4, which stated that masculinity ratio and high parity would be positively related, was also supported by the present data. Degree of urbanization and median income were negatively related to high parity and masculinity ratio, although the correlation between median income and masculinity ratio was not statistically significant. Similarly, extent of primary industry and infant mortality rate were positively related to high parity and masculinity ratio, although the correlation between infant mortality rate and masculinity ratio was not statistically significant. Thus, Proposition 5, which stated that high parity and masculinity ratio would be negatively associated with economic development, received partial support from the data.

DIRECT EFFECTS OF INDEPENDENT VARIABLES ON FERTILITY

Research Propositions 7, 8, and 9 stated the anticipated direct effects of the six independent variables on fertility. Degree of urbanization and median income were expected to have negative effects on fertility (Proposition 7). Extent of primary industry, infant mortality rate, high parity and the masculinity ratio were expected to have positive direct effects on fertility

(Propositions 8 and 9). The data analysis suggested partial support for Propositions 7 and 9, and full support for Proposition 8. Five of the six independent variables were significantly related to fertility when their effects were considered simultaneously through multiple regression. Four of these affected fertility as anticipated: high parity, infant mortality rate, and extent of primary industry affected fertility positively and degree of urbanization affected fertility negatively. Median income, however, was found to affect fertility positively when the influences of other variables in the regression equation were controlled. A negative relationship between median income and fertility was established as anticipated only when zero order correlation was considered. Masculinity ratio did not have a significant direct effect on fertility when the other independent variables were considered.

The majority of these relationships have been discussed in other studies in the field. Most of the findings of other studies are compatible with the present findings, except where the findings reported in the literature have been contradictory or incompatible with each other. The association between income and fertility is one that has been under controversy for some time. Studies of this relationship have discovered different patterns of association between these variables for different populations, measurements, and years. Some of these

studies lend support to the present findings -- of negative correlation and positive direct effect between median income and fertility -- by showing that the relationship between fertility and income varies when various other factors are considered. In particular support of the present findings was the recent study by Jacques Henripin. He stated that the apparent negative effect of income on fertility was an illusion. The negative association, he felt, was due to several other characteristics that varied with income. The depressive effect of these variables on fertility was stronger than the positive effect of income. He concluded that, generally, a positive relationship was developing between income and fertility and that this was already the prevailing relationship among young urban couples in Canada. He added that fertility varied positively with husband's income for all women, but negatively for women in the labor force (Henripin, 1972, pp. 276-304).

Another study of income and fertility in Canada showed that the time series relationship between per capita personal real income and total fertility rate was mainly positive from 1926 to 1957, but negative from 1958 to 1964. When cross-sectional measurements for certain points in time were examined, however, a different pattern of relationship emerged. Number of children tended to vary inversely with family income in 1941 and 1951.

This association became curvilinear in 1961, with the highest income groups having the largest average number of children (Rao, 1972, pp. 45, 113).

A study by Richard Easterlin also found a positive association between measures of total fertility and income in the United States. Studying figures for total fertility rate by year from 1940 to 1965 and total per capita disposable income, in 1964 dollars, by year, he found that both showed an increase over this period (Easterlin, 1966, pp. 133-134).

In a study of native white American couples with two children, living in metropolitan areas, Westoff, Potter and Sagi found that the relationship between income and fertility was different for the major religious groups. The couples were interviewed first in 1957, then again in 1960. For Protestants, the correlations of income and feelings of economic security with the number of additional pregnancies and the number of children desired most were negative. For Catholics and Jews, however, these correlations were positive, although not as strong as the negative correlations for Protestants (Westoff *et al*., 1963, pp. 1, 113).

David Heer reported that the relationship between income and fertility was changing. He stated that a change from a negative to a positive relationship between husband's income and fertility was emerging. This was illustrated by the fact that, of white women in urban areas, those over fifty years of

age with husbands earning at least $10,000 had the fewest children, but those aged thirty to thirty-nine with husbands earning $10,000 and more had the most children. For the United States in 1960, the fertility of married women aged thirty-five to forty-four, by husband's income, produced a U-shape distribution, with the highest and lowest income groups having the greatest fertility. He found some regional variation in this pattern, however. In some New England states, with few low-income farm families, fertility was positively related to husband's income, whereas in some Southern states, the relationship was negative (Heer, 1968, p. 52).

Another study of husband's income and fertility, using cumulative fertility or parity as the measure of fertility, found a difference in the association between these variables when age was examined. For white women under age twenty-five, there was a general positive relationship between husband's income and number of children. For women thirty and over, the relationship was generally negative, and for women aged twenty-five to twenty-nine, no clear association appeared. The authors proposed two possible explanations. The positive relation for young women could be a harbinger of a similar relationship, even at older ages, for the future. Alternatively, the fertility of young, recently married women was more likely to be positively related to current income than was total fertility after a longer duration of marriage (Kiser _et al_., 1968, pp. 208-210).

A much earlier study by Herberle in 1942, cited by Freedman, suggested that fertility was positively associated with relative income. The extent to which a couple's income exceeded the average income of couples in their class level, as defined by occupation, education, etcetera, was positively correlated with their fertility (Freedman, 1961-1962, p. 60). Freedman also reported some reversal in the negative association between status and fertility even before World War II. A stronger positive correlation was found for those with indigenous urban background. He considered this to be consistent with the idea that a positive relation between income and fertility will prevail in a mature urban society (Freedman, 1961-1962, p. 60).

The discovery of a positive direct effect between median income and fertility in the presence of a negative correlation between these variables was best supported by Jacques Henripin's recent study of fertility. Some of the other studies mentioned also suggested explanations for a difference in sign of the relationship between fertility and income when other factors were considered or when different measures of the two variables were employed.

The relationships between fertility and degree of urbanization, infant mortality rate, and extent of primary industry were as hypothesized and did not suggest any problems in interpretation. The negative direct effect of degree of urbanization on fertility

was in keeping with the differences in average family size between rural and urban areas in Canada and the United States. In Canada in 1961, the average number of children per family was 2.4 for rural farm residents, 2.2 for rural non-farm residents, and 1.7 for urban residents (Kalbach and McVey, 1971, pp. 293-294). Henripin noted that, for all provinces and for Canada as a whole, the rural child-woman ratio was greater than the urban child-woman ratio, for all census years, 1921 to 1961 (Henripin, 1972, p. 82). The average number of children in the United States, for all women aged forty-five to forty-nine, was 1.9 for residents of urban areas (50,000 population or more) and 3.2 for farm residents (Heer, 1968, p. 50). Whelpton, Campbell and Patterson discussed reasons for the rural-urban fertility differential since the Colonial period, but stated that these differences were diminishing. Increasing communication and mobility has blurred the distinctions between urban and rural life, and economic and technological changes in agriculture are eliminating the economic advantages of a large family even on the farm (Whelpton _et al._, 1966, p. 116).

It is axiomatic that if people plan to bring up a definite number of children, a reduction in infant mortality will cause a decline in the number of births. Various studies of geographical variations showed a positive association between these variables, and although one suggested that fertility directly affected infant

mortality, the opposite -- that infant mortality directly affected fertility -- was the more popular and more probable causal direction (United Nations, 1953, pp. 76, 134-135). A more recent study of eighty-five countries by Friedlander and Silver also lent some support to the findings of the present study. The authors reported that fertility and infant mortality were positively related for developed and intermediate countries, but negatively related for underdeveloped countries. When child mortality, rather than just infant mortality was examined, however, significant positive correlations with fertility emerged for all levels of development (Friedlander and Silver, 1967, p. 53).

Although no direct references to the association between fertility and either industrialization or sex ratio were discovered in the literature, the covariation of these variables with the other indicators of economic development suggested their association with fertility. Industrialization and urbanization have been frequently considered together, almost as slightly different indicators of the same phenomenon. Friedlander and Silver used extent of the agricultural population as a negative indicator of urbanization. This measure is closely akin to the extent of primary industry which was used in the present study as a negative indicator of industrialization (Friendlander and Silver, 1967, p. 54). The masculinity ratio has been found to decline with economic development (Cowgill, 1970, pp. 631-632).

Thus, the positive direct effects of both extent of primary industry and masculinity ratio on fertility were in harmony with the general body of literature surrounding the demographic effects of economic development, even though the effect of masculinity ratio was too slight for statistical significance when considered in conjunction with the other variables in the regression equation.

The positive association between fertility rate and parity measures has not been discussed in the literature, probably because many researchers view these variables only as alternative measures of fertility and do not consider that a direct effect between them is worth mentioning. In this study, however, high parity has been thought of as more than just another measure of fertility. Parity is a cumulative measure of the fertility histories of all adult women, not just those in the childbearing ages. For these reasons, it was anticipated that the proportion of women reaching high parity would represent more than the fertility of an area: it would also serve to illustrate differences in family size attitudes and norms. Thus, areas where many women had four or more children would be following more traditional value systems. These values would influence the current fertility behavior of those areas positively.

DIRECT EFFECTS OF INDEPENDENT VARIABLES ON FEMALE LABOR FORCE PARTICIPATION

Propositions 10, 11, and 12 stated the anticipated direct effects of the six independent variables on female labor force participation. Degree of urbanization and median income were expected to have positive direct effects on female labor force participation (Proposition 10). Extent of primary industry, infant mortality, masculinity ratio, and high parity were expected to have negative direct effects on female labor force participation (Propositions 11 and 12). Each of the three propositions received partial support from the data analysis. Four of the six independent variables had significant direct effects on female labor force participation as measured through regression analysis. Three of these affected female employment as anticipated: extent of primary industry and high parity, negatively, and median income, positively. The positive effect of infant mortality rate when the influences of the other three variables were controlled by the regression procedure, however, was contrary to expectations. Sex ratio and degree of urbanization did not have significant direct effects on female labor force participation when the other independent variables were considered. The relationship between high parity and female labor force participation will be discussed in conjunction with the relationship between fertility and female employment.

The strong negative direct effect of extent of primary industry on female labor force participation was supported by Valerie Oppenheimer's discussion of demand for female labor in the United States. She stated that the industrial and occupational changes characteristic of a developing economy and noticeable in the United States in the past century all favor women over men. The increase in labor demand is greatest in industries and occupations that have been important employers of women. Thus, the demand for women workers increases with economic development because the occupations that typically acquire female sex labels grow rapidly as an economy develops (Oppenheimer, 1970, p. 157). Thus, industrialization has produced a demand for female labor to meet the increased supply it made available by changing the traditional life styles and activities of women.

The positive direct effect of median income on female labor force participation was not strongly supported by the literature. Many of the studies relating income to female employment have dealt with individual correlations between husband's income and wife's employment status, however, rather than with ecological correlations as did the present study. Individual income may be expected to influence the individual participation of women in the labor force differently than median income influences the total female labor force participation of an area. Family income, measured against the family's needs and aspirations, may

affect the wife's employment status negatively. Median income, however, as an indicator of the economic development and prosperity of an area, may affect female employment rates positively.

Examination of female employment rates and per capita income over time provides support for this latter statement. Oppenheimer reported that both real income and female labor force participation increased over time in the United States. The proportion of women fourteen years of age and older in the labor force increased from 25.8 per cent in 1940 to 34.5 per cent in 1960. The disposable per capita personal income in 1964 dollars increased from $1,329 in 1940 to $2,021 in 1960 and to $2,248 in 1964 (Oppenheimer, 1970, pp. 8, 30). Recent figures have suggested, however, that even on the individual level, a positive association between wife's employment and husband's income may be emerging. Oppenheimer stated that the negative asscciation between these variables was no longer uniform. For example, in March, 1963, the labor force participation of women aged 14 to 34 and 55 and over, with no children under 18, was positively correlated with husband's income, "up to the $7,000-or-over bracket", and some reversals of the negative correlations for women with school-age children were also apparent (Oppenheimer, 1970, p. 29). Nye and Hoffman reported that an analysis of 1940 and 1950 census data by Dornbusch and Heer also showed varying results for ecological measures. Female labor force participation and median male

income were negatively correlated in 1940, but positively correlated in 1950, at least for Caucasian women. In 1950 there was also a higher rate of female employment in the more prosperous communities, and more recent census releases showed a trend toward the increased economic involvement of women in middle class families (Nye and Hoffman, 1963, p. 11).

The positive direct effect of infant mortality rate on female labor force participation when the effects of other variables had been controlled by the regression procedure was contrary to expectations and was not supported or discussed by the literature. The hypothesis of a negative relationship between these variables was based on the indications in the literature that infant mortality rate declined with increased economic development and that female labor force participation increased with this development. A positive association between female employment and infant mortality within certain levels of industrialization, high parity and median income may, however, be logical. For example, in a poor area where large families are common and infant mortality rates are high, such as an urban ghetto, many women may be the sole supporters of large families and thus forced to work. The use of ecological data at the state- or province-wide level precludes any conclusive statements regarding the patterns of relationship between variables within a specified range of variation.

As with infant mortality, nothing in the literature discussed the relationship between masculinity ratio and female labor force participation, although some reference was made to the general decline of masculinity ratio as the economy of a country developed and its population aged, as mentioned earlier in this chapter. It was anticipated that in an area where women outnumbered men, fewer women would marry and more would be required to fill bisexual occupations, thus increasing the rate of female employment. No support for this idea was found in the present study, however, as neither the correlation coefficient nor the beta weight of masculinity ratio associated with female labor force participation was significant.

Degree of urbanization was expected to have a significant positive direct effect on female labor force participation. Although the direct effect of this variable was not significant when the effects of the other independent variables were controlled by the regression analysis, the positive zero order correlation between degree of urbanization and female employment was significant. This finding was supported by the association discussed by Kalbach and McVey. Using data from Canadian census publications, these authors showed that labor force participation rates were consistently higher for urban women than for rural women, for all age groups (Kalbach and McVey, 1971, pp. 225-226).

ASYMMETRIC RELATIONSHIPS BETWEEN HIGH PARITY, FERTILITY AND FEMALE LABOR FORCE PARTICIPATION

The direction of causality between fertility and female labor force participation was not hypothesized in this study. The literature was divided regarding the causal association, if any, between these variables. For this reason each of these variables was included in the regression analysis of the other to discover if either variable had a significant direct effect on the other when the effects of the independent variables were controlled by the regression procedure. Neither fertility rate nor female labor force participation had a significant direct effect on the other when the effects of other variables were controlled by the regression procedure. A significant negative symmetrical relationship between the two variables was found, however, as stated in Proposition 6.

High parity was the best single predictor of fertility identified by the regression procedure, and the second predictor in the regression analysis of female labor force participation. Because high parity was essentially a measure of cumulative fertility, the regression equation formed with high parity as the dependent variable was examined. The direct effects acting between female labor force participation and high parity could then be examined in connection with the relationship between fertility and female employment. The validity of the assumption

that high parity represented more than the cumulative fertility of an area could also be assessed by comparing the regression equations of fertility and high parity.

The regression procedure selected five variables as predictors of high parity. These variables, in order of their entry into the regression equation, were: extent of primary industry, masculinity ratio, median income, female labor force participation and fertility rate. Hypotheses regarding asymmetric associations with high parity as a dependent had not been formulated. However, the signs of the discovered direct effects were in keeping with the hypotheses concerning symmetrical relationships between high parity and the other variables.

Direct Effect Between High Parity and Female Labor Force Participation

The high parity measure has been considered, in this study, to be an indicator of strength of traditional family attitudes and values, as well as being an alternative measure of fertility. Its validity as a measure of fertility, however, must not be overlooked. Since high parity was the second most important predictor of female labor force participation, entering the regression equation after extent of primary industry, it was apparent that cumulative fertility, if not current fertility, significantly affected the female labor force participation of an area.

To determine whether or not this asymmetrical association was realiable evidence of the causality operating between cumulative fertility and female labor force participation, the regression analyses of both variables were compared. If female labor force participation was as important a predictor of high parity, as high parity was of female labor force participation, then the direction of causality could not be assumed. The multiple coefficient of determination, R^2, for female labor force participation increased by seven percentage points when high parity was added to the regression equation at the second step. Thus, high parity improved the prediction of female employment rate by seven percentage points. Female labor force participation did have a significant direct effect on high parity as well, although this variable entered the regression equation for high parity fourth and contributed only an additional three percentage points to the predictive power of this equation. Thus, high parity would seem to be a better predictor of female labor force participation than this latter variable would be of high parity.

It is suggested from these findings that if a causal interpretation were made concerning this relationship, it would be that the extent of high parity in an area inversely affects female labor force participation rate. This statement refers to ecological correlations and cannot be interpreted to mean

that women reaching high parity will be less likely to work than women with few children, although some of the literature has suggested that the latter was also true.

One study reported that, for all age groups over fifteen and for all types of residence in Canada, the number of live births per 1,000 women in the labor force was smaller than the number per 1,000 women not in the labor force, although the differences were slight for farm women aged sixty and over. In addition, the proportion of economically active married women having zero, one or two children was greater than that proportion of the economically inactive married women. More of the latter had three or more children (Henripin, 1972, pp. 294-298). Paul Glick found that the rate of childlessness of white women aged thirty-five to thirty-nine in urban areas was three times as high for women who worked as for those who did not. He also stated that the fertility rates were 1.63 children per woman for those who worked and 2.88 for those never employed (Glick, 1967, p. 213).

Evidence suggesting that female labor force participation influenced fertility (or parity), rather than vice-versa, has been provided by several studies. Whelpton, Campbell and Patterson found that the incidence of completely planned fertility was greater among wives who said they worked because they liked to, than among those who worked because they needed the money.

The former women also had and expected significantly fewer children than the latter. Regardless of reason for working, however, women who had worked during marriage had fewer births by 1960 and expected fewer children than did women who had not worked after marriage. A negative relationship was also found between fertility and the duration of the wife's work experience (Whelpton et al., 1966, pp. 107-109, 259). Similar discoveries were made in an earlier study by Freedman, Whelpton and Campbell. Among fecund couples, working women were more likely than non-working women to have completely planned fertility, and were much more likely to be in the "Completely Planned never-pregnant group" (Freedman et al., 1959, p. 137).

Direct Effect Between High Parity and Fertility

Comparison of the regression models for fertility and high parity showed that, although the high parity measure was very important in the prediction of the current fertility of an area, the fertility rate added very little to the prediction of the extent of high parity in an area. That is, high parity by itself explained thirty-four per cent of the variation in fertility, but fertility, when it entered the regression equation for high parity as the final significant variable, explained only an additional three percentage points of the variation in high parity. High parity, therefore, had a much stronger direct effect

on fertility than fertility had on high parity. This finding supported the notion that the extent of high parity in an area measured something more than cumulative fertility alone. If high parity was nothing more than an alternative measure of fertility, one would have expected fertility to be the best single predictor of high parity, just as high parity was of fertility.

It must be remembered, however, that parity has not been proven to be more than an alternate measure of fertility. If it has no deeper significance, the inclusion of high parity in the regression model of fertility rate would not be advisable. This risk has been taken in the present study, however, because the model with high parity explained a greater proportion of the variance in fertility than did an alternative model without high parity. If the parity measure represents more than just fertility, as this writer believes it does, its inclusion provides a better prediction of fertility than otherwise available.

SUGGESTIONS FOR FURTHER STUDY

The relationships between the variables examined in this study were fairly consistent with the research propositions and with the literature consulted. The interpretation of the results and generalization from them, however, have been restricted by the type of data measurement, the units of analysis employed, and

the population studied. The use of macro data precluded conclusions regarding the effects of the demographic and economic factors on individual fertility and female labor force activity. The population under study was that of two highly economically developed Western countries. The range of variation of the pertinent variables, between states and provinces within this fairly homogeneous population, was probably quite minor when compared with the range of variation between countries at different stages of economic development. Generalizations from the present study population to the populations of countries at varying levels of economic development should therefore be treated with caution or avoided. The use of cross sectional analysis at one point in time also prohibited the suggestion of trends over time from the findings of the present study.

One suggestion for further research would be to test the associations between the same or similar measures of the present variables for different populations, units of analysis, and levels of measurement so that the restrictions in interpreting the present findings could be removed. An examination of the variables of this study for several countries at different stages of economic development or for several other developed countries with different cultures would extend the generality of the present findings. Different units of analysis could also be used to study Canada and the United States, either together or separately. The population could be differentiated by region, urban-rural, population size or

population density of place of residence rather than by state or province. Micro rather than macro data could be used to study the associations between the present variables when individual rather than ecological correlations are examined. If the difficulties in treating longitudinal data were resolved, longitudinal rather than cross-sectional measurement could be used to explore the changes in associations between variables over time rather than their differences between areas at one point in time. Both of these latter approaches would add to the scope and explanatory value of the present findings.

The examination of the same factors using micro data or smaller, more homogeneous units of macro data might clarify the relationships found in the present study, especially the findings that were contrary to expectation. For example, examination of the same factors within different communities and districts of cities might disclose the nature of the associations between variables that would result in a positive association between infant mortality and female labor force participation.

If micro data and individual correlations were used in place of the present ecological correlations, several changes in the definition and measurement of the variables under study would be necessary. Some of these changes would be straight forward, from rates and proportions to categories: degree of urbanization would become urban or rural residence or size of

place of residence; proportion in the labor force would change to working or not working; median income would become income of husband. The fertility and high parity measures, when reduced to the individual level could be handled as one variable, number of children ever born -- the actual parity of the woman -- although age of youngest child, number of pre-school children, and other refinements of the fertility measure could be introduced. Extent of primary industry would most likely change to the industrial classification of the husband's occupation into primary, secondary or tertiary industry. Again, further refinements of this measure could be introduced. Two of the present variables, however, infant mortality rate and sex ratio, could not easily be transformed to individual variations.

In addition to examining the relationships between the present variables under different conditions or measurement, new variables might be introduced so that their effects on fertility and female labor force participation could be studied. Many of the possible combinations of variables have been examined by different authors, for various populations and levels of measurement, but many possibilities for innovative research in this field still exist. A study of fertility by the United Nations found that, although urbanization, income, industrialization and infant mortality were significantly correlated with a country's level of fertility, the four factors most strongly correlated with

fertility were radio receivers per 1,000 inhabitants, newspaper circulation, life expectancy, and hospital beds per 1,000 inhabitants. Extent of early marriage, per capita energy consumption, and female literacy level were also more strongly related to fertility than were the economic factors of the present study (United Nations, 1965, pp. 145-147). A detailed examination of the effects of all of these factors on fertility and female labor force participation at either macro or micro levels of investigation would be a pertinent future research endeavor. Other variables which might be examined in relation to fertility and female employment at the macro level are average education or literacy levels, average age at marriage, and proportion married in each successive age group. The dominant religious beliefs and national policies of an area and the stand these take toward various social issues -- such as status of women, female employment, public child-care centers, family allowance, birth control, abortion, sterilization, legal age at marriage, illegitimacy, social welfare, old-age security, medicare, etcetera -- should also be examined to determine their effects on fertility and female labor force participation.

The effects of most of these factors on individual fertility and female employment could be studied by converting the demographic factors to individual measurement and the religious and legal policies to personal attitudes regarding social issues. Thus,

the education and religion of the husband and/or the wife, and their ages when they married could be studied with regard to the woman's fertility and married work history. The couple's attitudes toward and practice of birth control, their desired and expected family size, the success of their family planning, the types of birth control they use, and the types of husband-wife roles they follow could all affect their fertility and could either influence or be influenced by the wife's employment. Similarly, the attitudes of the couple towards the wife's employment and her reasons for working could affect or be affected by her fertility. Many of these variables have been discussed in previous studies (Westoff et al., 1963; Nye et al., 1963; Whelpton et al., 1966), but additions to their findings can still be made by examining the relationships of similar factors in different geographic, economic and cultural settings.

There are still other possibilites for expanding and refining research on fertility and female labor force participation. Measures associated with the family of origin of both husband and wife -- such as ethnic origin, time of migration, urban-rural background; father's (or mother's) education, income, occupation or social class; and number of siblings -- could play a significant part in determining present family size, wife-and-mother roles, and wife's employment. The physical and social mobility of a couple could also influence fertility and female labor force participation.

Although most of these variables have been studied by past researchers, their simultaneous or combined effects on fertility and female labor force participation have not been fully examined. Since fertility is now the determining component of population growth in developed countries, factors which affect fertility are important considerations for demographers. The growing significance of female labor force participation, especially of married women, in developed countries and the inverse relationship between fertility and female labor force participation makes the examination of all factors which influence either of these variables an important pursuit for demographers.

LIST OF REFERENCES

Allingham, John D., 1967a. "The Demographic Background to Change in the Number and Composition of Female Wage-Earners in Canada, 1951-1961". Dominion Bureau of Statistics, Special Labour Force Studies No. 1, Series B. (Ottawa: Queen's Printer).

Allingham, John D., 1967b. "Women Who Work: Part 1". Dominion Bureau of Statistics. Special Labour Force Studies No. 5. (Ottawa: Queen's Printer).

Allingham, John D., and Byron G. Spencer, 1968. "Women Who Work: Part 2. Married Women in the Labor Force: the influence of Age, Education, Child Bearing, Status and Residence". Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 1. (Ottawa: Queen's Printer).*

Blalock, Hubert M. Jr., 1960. Social Statistics. (New York: McGraw-Hill Book Company, Inc.).*

Bogue, Donald J., 1969. Principles of Demography. (New York: John Wiley and Sons, Inc.).*

Canada, Department of Labour, 1964. Women at Work in Canada a fact book on the Female Labour Force. (Ottawa: Queen's Printer).

Canada, Department of Labour, Women's Bureau, 1965. "Report of a Consultation on the Employment of Women with Family Responsibilities". (Ottawa: mimeographed).*

Canada, Department of Labour, Women's Bureau, 1966. "Characteristics of Women in the Labour Force: 1965". Labour Gazette. 66(7): 452.*

Canada: Dominion Bureau of Statistics, 1962. Census of Canada, 1961, Vol. 1, Part 1, Population; Geogrpahical Distributions, Bulletin 6, Tables 10, 11. (Ottawa: Queen's Printer).

Canada: Dominion Bureau of Statistics, 1962. Census of Canada, 1961, Vol. 1, Part 2, Population; General Characteristics, Bulletin 3, Table 26. (Ottawa: Queen's Printer).

Canada: Dominion Bureau of Statistics, 1963a. Census of Canada, 1961, Vol. 3, Part 2, Labour Force; Industries, Bulletin 1, Table 1; Bulletins 6-9, Table 9.

Canada: Dominion Bureau of Statistics, 1963b. Vital Statistics 1961. (Ottawa: Queen's Printer). Table Q, p. 47, Table B6, pp. 99-101.

Canada: Dominion Bureau of Statistics, 1964. Census of Canada, 1961, Vol. 3, Part 1, Labour Force; Occupations, Bulletin 2, Table 5. (Ottawa: Queen's Printer).

Canada: Dominion Bureau of Statistics, 1966. Census of Canada, 1961 Vol. 4, Part 1, Population Sample; Income, Migration, Fertility, Bulletin 1, Table 1; Bulletin 7, Table G1.

Carleton, Robert O., 1965. "Labor Force Participation: A Stimulus to Fertility in Puerto Rico?". Demography, Vol. 2, pp. 233-239.

Chisholm, Roger K., and Gilbert R. Whitaker, Jr., 1971. Forecasting Methods. (Homewood, Illinois: Richard D. Urwin, Inc.).

Cho, Lee-Jay, Wilson H. Grabill and Donald J. Bogue, 1970. Differential Current Fertility in the United States. (Chicago: University of Chicago).

Coale, Ansley J., 1967. "Factors Associated with the Development of Low Fertility: An Historic Summary". World Population Conference, 1965, Vol. II, pp. 205-209. (New York: United Nations).

Collver, O. Andrew, 1968. "Women's Work Participation and Fertility in Metropolitan Areas". Demography, Vol. 5, No. 1, pp. 55-60.

Cowgill, Donald O., 1970. "Transition Theory as General Population Theory" in Social Demography edited by Thomas R. Ford and Gordon F. DeJong. (Englewood Cliffs, N.J.: Prentice-Hall, Inc.) pp. 627-633.

Davidson, Maria, 1968. "Factors Related to Work Participation of Married Women". Paper prepared for presentation at the annual meeting of the Population Association of America, Boston, Mass., April 18 to 20, 1968.*

Easterlin, Richard A., 1966. "On the Relation of Economic Factors to Recent and Projected Fertility Changes". Demography, Vol. 3, No. 1, pp. 131-153.

Easterlin, Richard A., 1968. Population, Labor Force, and Long Swings in Economic Growth: The American Experience. (New York: National Bureau of Economic Research; Distributed by Columbia University Press).*

Elkin, Frederick, 1964. The Family in Canada. (Ottawa: The Vanier Institute of the Family).*

Freedman, Ronald, Pascal K. Whelpton, and Arthur Campbell, 1959. Family Planning, Sterility and Population Growth. (New York: McGraw-Hill Book Company, Inc.).

Freedman, Ronald, 1961-1962. "The Sociology of Human Fertility: A Trend Report and Bibliography". Current Sociology, Vols. X, XI, No. 2.

Friedlander, Stanley and Morris Silver, 1967. "A Quantitative Study of the Determinants of Fertility Behavior". Demography, Vol. 4, No. 1, pp. 30-70.

Gendell, Murray, 1963. Swedish Working Wives: A Study of Determinants and Consequences. (Totowa, N.J.: Bedminster Press).*

Gendell, Murray, 1967. "The Influences of Family-Building Activity on Women's Rate of Economic Activity". World Population Conference, 1965, Vol. IV, pp. 283-287. (New York: United Nations).

Glick, Paul C. and Robert Parke Jr., 1965. "New Approaches in Studying the Life Cycle of the Family". Demography, Vol. 2, pp. 187-202.

Glick, Paul C., 1967. "Marriage and Family Variables Related to Fertility". World Population Conference, 1965, Vol. II, pp. 210-213. (New York: United Nations).

Goode, William J., 1964. The Family. Foundations of Modern Sociology Series. (Englewood Cliffs, New Jersey: Prentice-Hall, Inc.).

Grabill, Wilson H., Clyde V. Kiser, and Pascal K. Whelpton, 1958. The Fertility of American Women. (New York: John Wiley and Sons, Inc.).*

Hawthorn, Geoffrey, 1970. The Sociology of Fertility. (London: Collier-Macmillan Limited).

Heer, David M., 1966. "Economic Development and Fertility". Demography, Vol. 3, No. 2, pp. 423-444.

Heer, David M., 1968. Society and Population. (Englewood Cliffs, New Jersey: Prentice-Hall, Inc.).

Henripin, Jacques, 1972. Trends and Factors of Fertility in Canada. (Ottawa: Statistics Canada).

Hunt, Chester L., 1970. "Female Occupational Roles and Urban Sex Ratios in the United States, Japan, and the Philippines" in Social Demography edited by Thomas R. Ford and Gordon F. DeJong. (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), pp. 308-321.

James, Edw., 1962. "Women at Work in Twentieth Century Britain". Manchester School of Economics and Social Studies, Vol. 30, No. 3, pp. 282-299.*

Jephcott, Pearl, 1962. Married Women Working. (London: George Allen and Unwin Ltd.).*

Kalbach, Warren E., and Wayne W. McVey, 1971. The Demographic Bases of Canadian Society. (Toronto: McGraw-Hill Company of Canada Ltd.).

Kelsall, R.K., and Sheila Mitchell, 1959. "Married Women and Employment in England and Wales". Population Studies, Vol. 13, No. 1, pp. 19-33.*

Kiser, Clyde V., Wilson H. Grabill, and Arthur A. Campbell, 1968. Trends and Variations in Fertility in the United States. (Cambridge: Harvard University Press).

Klein, Viola. Working Wives. Occasional Papers No. 15. (London: Institute of Personnel Management). No date.*

Myrdal, Alva and Viola Klein, 1956. Women's Two Roles. (London: Routledge and Kegan Paul Ltd.).*

National Bureau of Economic Research, 1960. Demographic and Economic Change in Developed Countries. (Princeton: Princeton University Press).*

National Manpower Council, 1958. Work in the Lives of Married Women. (New York: Columbia University Press).*

Nie, Norman H., Dale H. Bent, and C. Hadlai Hull, 1970. Statistical Package for the Social Sciences. (New York: McGraw-Hill Book Company).

Nye, Ivan F., and Lois W. Hoffman, 1963. The Employed Mother in America. (Chicago: Rand McNally & Company).

Oppenheimer, Valerie Kincade, 1970. The Female Labor Force In The United States. Population Monograph Series, No. 5. (Berkeley: University of California).

Ostry, Sylvia, 1968. The Female Worker in Canada. 1961 Census Monograph Programme. (Ottawa: Dominion Bureau of Statistics).

Ostry, Sylvia, 1970. "Labour Force Participation and Childbearing Status" in Demography and Educational Planning. (Toronto: Ontario Institute for Studies in Education), pp. 143-156.

Population Crisis Committee, 1972. Population Problems and Policies in Economically Advanced Countries. Report of a Conference at Ditchley Park, England, September 29 - October 2, 1972. (Washington, D.C.: The Population Crisis Committee).*

Population Reference Bureau, Inc., March 1954. "The Labor Force of the United States". Population Bulletin, Vol. X, No. 2.*

Population Reference Bureau, Inc., May 1964. "The U.S. Labor Force: 1950-1960 'Islands of Obsolete Capacity and Unwanted Skills'". Population Bulletin, Vol. XX, No. 3.*

Population Reference Bureau, Inc., September 1964. "New Patterns in U.S. Fertility". Population Bulletin, Vol. XX, No. 5.

Population Reference Bureau, Inc., August 1966. "'Boom Babies' Come of Age: The American Family at the Crossroads". Population Bulletin, Vol. XXII, No. 3.

Rao, Namperumal B., 1972. Fertility and Income in Canada: A Time Series and Cross Section Analysis. Unpublished Ph.D. dissertation, University of Alberta.

Ridley, J.C., 1959. "Number of Children Expected in Relation to Non-Familial Activities of the Wife". Milbank Memorial Fund Quarterly, Vol. 37, No. 3, pp. 277-296.*

Spencer, Byron G. and Dennis C. Featherstone, 1970. Married Female Labour Force Participation: A Micro Study. Special Labour Force Studies Series B, No. 4. (Ottawa: Dominion Bureau of Statistics).

Stycos, J. Mayone, 1965. "Female Employment and Fertility in Lima, Peru". The Milbank Memorial Fund Quarterly, Vol. XLIII, No. 1. (New York: Milbank Memorial Fund), pp. 42-54.

Stycos, J. Mayone, and R.H. Weller, 1967. "Female Working Roles and Fertility". Demography, Vol. 4, No. 1, pp. 210-217.

Sweet, James A., 1970. "Family Composition and the Labor Force Activity of American Wives". Demography, Vol. 7, No. 2, pp. 195-209.*

United Nations, 1953. The Determinants and Consequences of Population Trends. Population Studies Number 17. (New York: United Nations).

United Nations, 1962. Demographic Aspects of Manpower. Report 1, Sex and Age Patterns of Participation in Economic Activities. Population Studies Number 33. (New York: United Nations).

United Nations, 1965. Population Bulletin of the United Nations, Number 7 - 1963. With special reference to conditions and trends of fertility in the world. (New York: United Nations).

United States Department of Commerce, Bureau of the Census, 1963. 1960 Census of Population, Vol. I, Characteristics of the Population, Parts 2-52, Tables 11, 16, 62, 76, 113, 116. (Washington: U.S. Government Printing Office).

United States Department of Health, Education and Welfare, 1968a. Trends in Illegitimacy, United States - 1940-1965. (Washington: National Center for Health Statistics).

United States Department of Health, Education, and Welfare, 1968b. Vital Statistics Rates in the United States 1940-1960. (Washington: National Center for Health Statistics), Table 22, pp. 150-162; Table 41, pp. 214-235.

Urlanis, B.T., 1967. "Dynamics of the Birth Rate in the Union of Soviet Socialist Republics and Factors Contributing to It". World Population Conference, 1965, Vol. II, pp. 237-238. (New York: United Nations).*

Westoff, Charles F., Robert G. Potter, Jr., Phillip C. Sagi, and Elliot G. Mishler, 1961. Family Growth in Metropolitan America. (Princeton: Princeton University Press).*

Westoff, Charles F., Robert G. Potter, Jr., and Phillip C. Sagi, 1963. The Third Child. (Princeton: Princeton University Press).

Whelpton, Pascal K., Arthur A. Campbell, and John E. Patterson, 1966. Fertility and Family Planning in the United States. (Princeton: Princeton University Press).

Whittingham, Frank J., and Bruce W. Wilkinson, 1967. Annual Work Patterns of the Canadian Population, 1964. Special Labour Force Study Number 2, Dominion Bureau of Statistics. (Ottawa: Queen's Printer).*

* Reference consulted, but not cited in text.